



p/n 88-020389-01 A

Dynaserv G2 Drive User Guide

Effective: March 1, 2002



Introduction

Thank you very much for your purchase of the DD servo actuator DYNASERV. The DYNASERV is an outer rotor type servo actuator that has achieved high torque, high speed, and high precision. It can be used in a wide range of applications in the FA device-related fields, such as industrial robotics and indexing.

This technical manual explains the DYNASERV DM/SR series motors as well as its combinations with the DrvGII drivers. Please refer to this technical manual thoroughly when you use the product.

Precautions for Using this Technical Manual

1. Please make sure that this manual is handed out to the end user.
2. Please read this manual thoroughly and understand the contents fully before proceeding to the operation of the product.
3. Please note that the safety protection may be lost and the proper safety may not be guaranteed if the product is not used according to the instructions described in this manual.
4. Always make sure that this manual is handy for the operator when using this product. If it is stained or lost, we will distribute copies upon request, subject to charge.
5. This manual explains details of the features included in the product and does not guarantee to meet the specific purpose of the customers.
6. No part of this manual may be reprinted or reproduced in any form without permission.
7. The information in this document is subject to change without notice.
8. The information contained in this document is believed to be accurate at the time of publication, but if you notice any inaccuracies, errors, or omissions, please contact our sales or service staff.

Regarding the safe usage of this device

- This product has been marked with  and  Warnings signs so that it can be used safely. Ignoring precautions and prohibitions related to these signs and using this product in an incorrect way may cause danger to the life and body of the operator. Always follow the precautions and observe the prohibitions explained below.
- Please make sure to understand the information given below completely before you start reading the technical manual.
- Please keep the technical manual and this sheet handy while using the product. In addition, make sure that they are handed out to the operator of the product.

Warnings

● **Warning about rotation:**

The motor periphery part of this device rotates at a high speed. People and objects should not be placed within the rotational radius when a load is attached to the motor.

● **Warning about electric shock:**

Make sure to connect the device to ground to avoid electric shock.

Make sure to turn the power off when connecting cables to the driver part.

Make sure to turn the power off when removing the cover of the driver part while performing adjustment operations, etc.

● **Fire and electric shock warning:**

If any abnormalities such as abnormal noise, bad smell, or release of fumes that coming from the device are detected while it is in operation, turn the power off immediately, pull out the power supply plug, and contact us.

If the device is dropped or given a strong impact, stop the operation immediately, turn the power off, and contact us.

Do not operate at power supply voltages other than the one indicated on the device.

● **Fire and electric shock warning:**

Avoid dropping or inserting metal shards or combustible materials, or allowing water to get into the opening parts of the device (e.g., the clearance between the rotor and stator of the motor part, or the air vent of the driver part). In such an eventuality, turn the power off immediately and contact us.

The cables coming out from the motor part or the bottom of the index part should not be forcibly bent, twisted, pulled, heated, or placed under a heavy object.

Never try to remodel or repair the device by yourself.

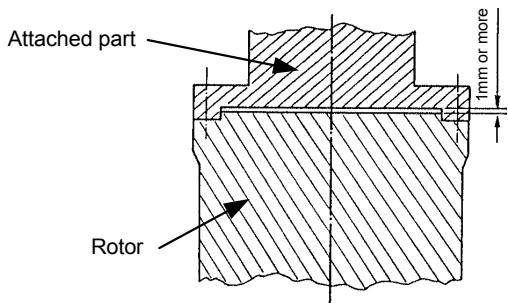
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Precautions

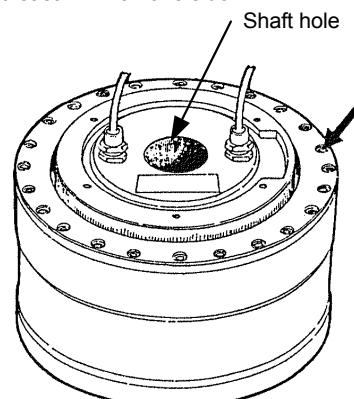
- Make sure to read the technical manual before using the device.
Operational mistakes and faulty wiring may result in damages and failure of the device.
- Make sure to check the wiring once more before turning the power on.
Faulty wiring may result in fire, electric shock, or damage of the device.
- Confirm that the proper combination of motor and driver parts is used. Using the device with an incorrect configuration may result in failure. (Be sure to confirm the model--MODEL--on the rating nameplates.)
- Make sure the conditions of temperature, humidity, dust, etc. are as specified for the installation and storage environments.
- Do not block the air vent of the device. Keep the specified open space around the device as well. Poor ventilation may cause overheating, leading to failure.
- Some of the motor parts are very heavy; please pay sufficient attention to this when carrying and installing the parts. If the weight is more than 10kg (22.04 lbs), carrying or lifting tools should be used as much as possible.
- Both the motor and driver parts should be installed in the specified orientation.
- Keep the protection cover (transparent plastic plate) attached on the power supply terminal part of the driver. It is provided to prevent inadvertent electric shock accidents.

Handling Precautions

1. Do not install the motor in reverse direction in such a way that the rotor of the motor is fixed and the stator rotates.
2. Make sure to turn the power off before removing the side panel of the driver to set jumpers, etc. Touching the high voltage part inside the driver is dangerous.
3. This motor rotates at a high speed and with a high torque. Take the rotation radius into consideration and pay special attention to the prevention of any dangerous situations that may occur during the operation when a load is attached to the motor.
4. Make sure to ground the ground terminal to earth.
5. When attached a load to the rotor, make sure to keep a clearance of 1 mm or more between the load and the upper surface of the motor in order to maintain the surface precision. Furthermore, never push or squeeze an object into the shaft hole. (See the figure below.)



When feeding an object through the shaft hole, make sure to secure a clearance of at least 1mm on one side.

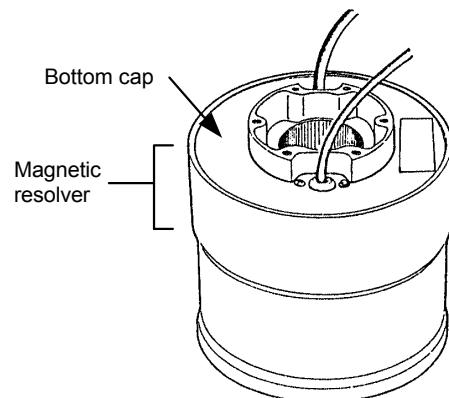


6. Do not touch the bolts (indicated by the arrow) that fix the bottom part of the rotor (see the figure to the right). If these bolts are loosened or tightened, the commutation angle will become inaccurate, which may result in uneven rotation (this applies only to the DM series).

DM series motor

7. The motor surface is magnetized; do not place things that can be affected by magnetism close to it.

8. The motor part shown in the figure to the right includes a magnetic resolver. Strong force, impacts, or magnetic fields should not be applied to the motor part (this applies only to the DR series).



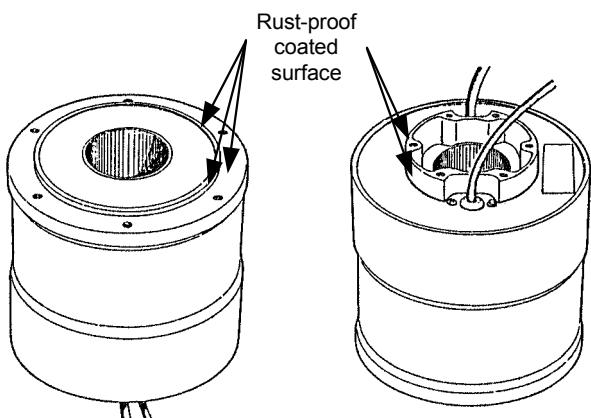
DR series motor

9. Make sure to use load attachment screws that are shorter than the effective depth of the thread in the motor part. Depending on the model, if a screw exceeds the effective thread depth, the function may be impaired (this applies only to the DR series).

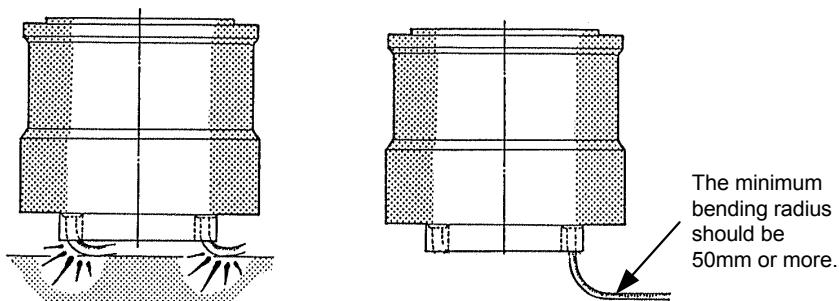
10. The motor is neither dust-, drip- nor water (oil)-proof; the motor should be installed in carefully chosen environments.
11. If the motor will be oscillating or rotating at small angles (50° or less), it should be allowed to oscillate at an angle of 90° or more for approximately 10 times (running-in operation) each time it has made 10,000 small-angle oscillations in order to prevent poor lubrication of the bearing.

12. In order for the motor and driver to be compatible with each other, they must be of the same model.

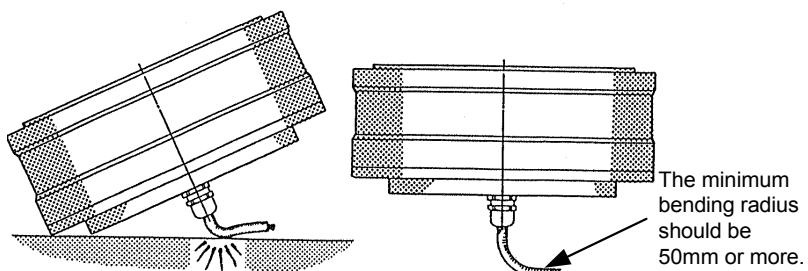
13. Never attempt to disassemble or remodel the motor and driver. If such service is necessary, please contact us. We assume no responsibility for products that have been disassembled or remodeled without permission.
14. For the DYNASERV DR series motors, a coating has been applied on the load attachment surface of the upper surface of the motor and the stator on the lower surface in order to prevent rust. When starting to use the product, wipe off the coating completely with cloth or paper soaked in a petroleum or chlorine solvent before assembling. If any of the coating remains, it may affect the mechanical precision.



15. Do not place the motor on the floor and other surface in the manner shown in the figure below when carrying and installing the DYNASERV. The cables are crushed by the motor's own weight and the copper wires may be broken inside the cables. If it cannot be avoided to place the motor in such a manner, a support bench should always be placed so that the cables are lifted. Furthermore, if the cables need to be bent when installed in a device, etc., the minimum bending radius should be 50 mm or more. The cables are not strong enough to live up to robot cable specifications, so they should not be bent repeatedly.



An example of a DM series motor



An example of a DM series motor

16. Do not perform a withstand voltage test on this device. If such a test is performed without discretion, the circuits may be damaged. If such test must be conducted, make sure to contact us.

17. When connecting the motor with a load, the centerlines of both cores should be aligned to a sufficient degree. Please note that if the deviation between the two cores becomes $10 \mu\text{m}$ or more, the bearings inside the motor may be damaged.

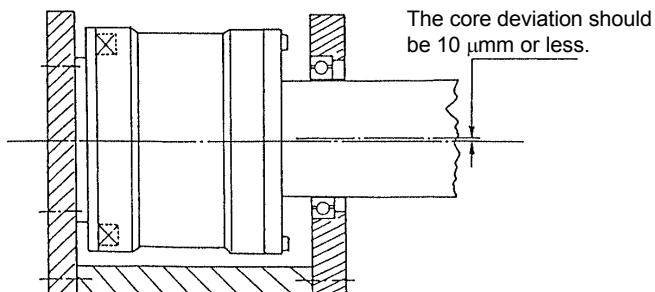


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Chapter 1

Overview of the Product

- 1.1 About the DYNASERV DM/DR Series
- 1.2 About the DrvGII Type Driver
- 1.3 Product Configuration
- 1.4 Model Names and Codes
- 1.5 Name and Function of Each Part
- 1.6 System Configuration Diagram

1 Overview of the Product

1.1 About the DYNASERV DM/DR Series

The DYNASERV servo motor, is a high speed, high torque, and high precision outer rotor type direct drive motor.

The DM series motors are contained in an aluminum chassis and have a built-in optical encoder. There are four models in the A series with output torques of 50 to 200N·m and five models in the B series with torques of 15 to 75N·m. The outside diameters are 264 mm for the A series and 160 mm for the B series. Each has a shaft hole of 58 mm and 25 mm in diameter at the center, respectively.

The outer shapes of the small-diameter and flat type DM series motors have successfully been made flatter and smaller in diameter based on the basic performance of the conventional DM/SD series. An outer diameter of 116 mm and a height (thickness) of 45 mm, respectively, are achieved for the DM small-diameter type and the DM flat type.

Both types are equipped with an optical encoder, which is characteristic of the DM series, and have the added features of high resolution and high mechanical precision. They are actuators with excellent output-to-space ratios and the best available option for servos for semi-conductor manufacturing devices, precision test devices, etc. They can be used in various applications.

The DYNASERV DR series is a series of operational direct drive motors that was developed based on the field-proven DM series to satisfy new demands. There are six A type models (50 to 400N·m) with an outer diameter of 264 mm (10 inches), seven E type models (30 to 250N·m) with an outer diameter of 205 mm (8 inches), and five B type models (8 to 60N·m) with an outer diameter of 150 mm (6 inches). In addition, there is a 5000B/E type (consisting of five high-speed type models).

Moreover, in addition to the above standard models, several special type models are also available, such as light-weight types, types with flanges, types with brakes, and high mechanical precision installation surface types.

1.2 About the DrvGII Type Driver

The DrvGII type driver is a digital servo driver with a RS232 communication, developed as the successor to the conventional SD/SR/TM type driver. Not only have the functions been improved, but also the driver box volume has been made smaller, and it can support the DYNASERV rotation type motors, as well as the LINEARSERV series motors that are of the direct drive type.

The features include the following:

- (1) The size of the driver is reduced to approximately half of the previous size (comparison within our company).
- (2) The internal resolution is increased by a factor of four for the DM series and a factor of two for the DR series.
- (3) It can now support most of the models of the DYNASERV and LINEARSERV series.
- (4) A sophisticated utility is now available and an oscilloscope function has been included as well.

1 Overview of the Product

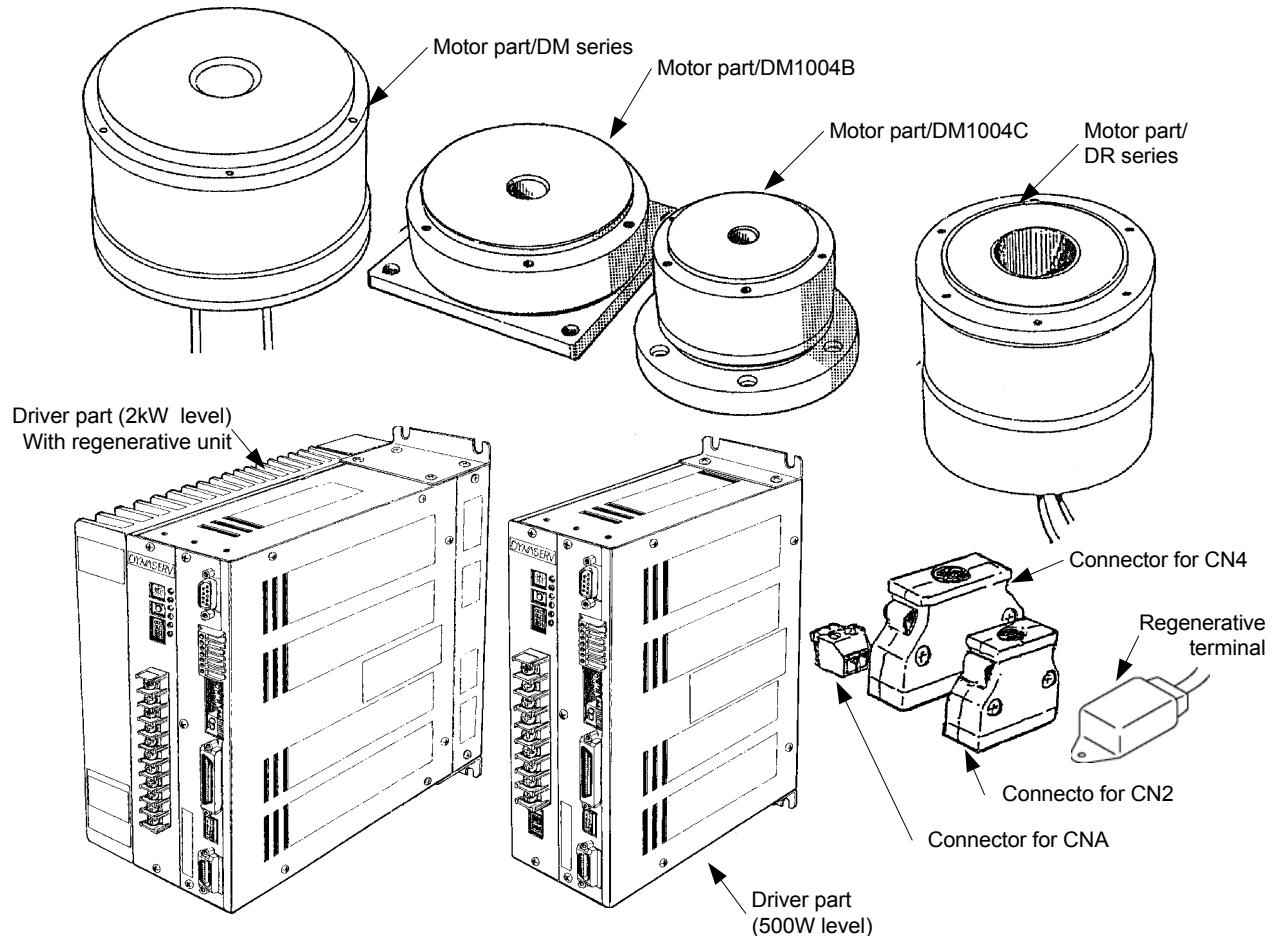
1.3 Product Configuration

The following shows the configuration of this product. Upon unpacking, please check the model name and code of the product's main unit, whether or not all the standard accessories are included, and also the quantity supplied.

Part name		Number	Notes	
Main body	Motor part	1	The external appearance varies depending on the model name/code.	
	Driver part	1	The external appearance varies depending on the model name/code.	
Standard accessory	Connector for driver CN2	1	Made by Honda Tsushin Kogyo (connector) PCR-S20FS (cover) PCR-LS20LA1	
	Connector for driver CN4	1	Made by Honda Tsushin Kogyo (connector) PCR-S50FS (cover) PCR-LS50LA	
	Connector for driver CN5*	1	Made by Phoenix Contact MC1, 5/6-ST-3, 81	
	Terminal for driver CNA**	1	Made by Phoenix Contact MC1, 5/2-ST-5, 08	
	Regenerative resistor **	1	80W 60Ω (for 100V) or 80W 200Ω (for 200V)	

* Supplied for drivers whose interface type is the I/O contact type.

** Supplied only for 500W level drivers with regenerative terminals



Note: The exact shape varies depending on the model you ordered. Refer to the figure showing the outer dimensions for more details.

1.4 Model Names and Codes

There are restrictions on the combination of specifications. Please check with our sales staff before determining the specification.

(1) Motor

□□□□□□□□□□—□ *1

■Motor series name (DM or DR) _____

■Design version (1: standard/5: high-speed) _____

■Maximum output torque (N·m, three-digit number) _____

■Motor type/outer diameter (A:Φ264/B:Φ160/C:Φ116/E:Φ205) _____

■Destination (0: domestic) _____

■Motor part special shape (0: standard/B: light-weight/C: with flange/D: with mechanical brake/F: with base) _____

■Mechanical precision - only for models requiring mechanical precision. Omitted if it is not required
(-1: mechanical precision of 5 mm or less/-2: mechanical precision of 10 mm or less/ μ m
-3: mechanical precision of 20 mm or less) _____

■With compatibility function _____

(2) Driver

□□□□□□□□□□—□□□—1

■Driver series name (UD for DM and UR for DR) _____

■Motor type/ (four-digit number of the motor, one line of alphabet letters) _____

■Box type/ (first digit 0: domestic standard/second digit A: 500W level without regenerative terminal, B: 500W level with regenerative terminal, K: 2kW level with built-in regenerative unit, L: 2kW level without regenerative unit) _____

■Current/ (A: 5A-DM small-diameter/B: 6A-DM flat/C: 15A-DMB type, DRB type, DR5000B type / D: 20A-DMA type, DRA type, DRE type, DR5000E type) _____

■Voltage/1: 100V system, 2: 200V system _____

■Interface/(first digit/S: pulse train position command, second digit/A: contact I/O voltage 12 to 24V + position command input; differential, B: contact I/O voltage 5V + position command input; differential) _____

■Option/0: none, N: with notch filter _____

■CE marking/no mark: no CE specification, *C: with CE mark specification* _____

Note: 1. Compatibility between the motor and driver is valid only between the same models.

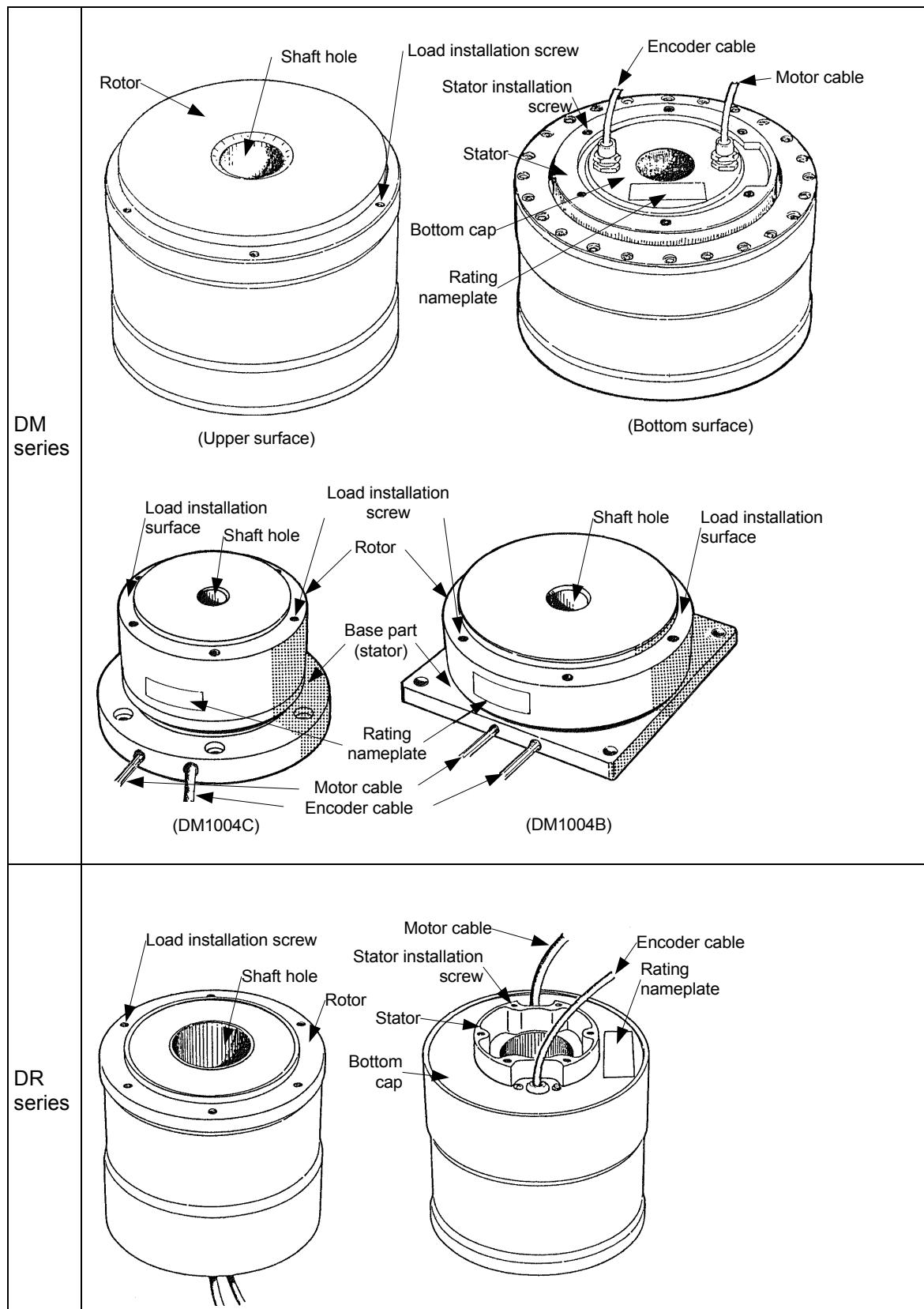
This means that, for the standard models, the motor and driver are compatible only when the designations of the five digits in motor type (DR□□□□□) and driver type (UR□□□□□) are the same.

2. Separate selection is required for the driver without 2 kW class regenerative unit.

1 Overview of the Product

1.5 Name and Function of Each Part

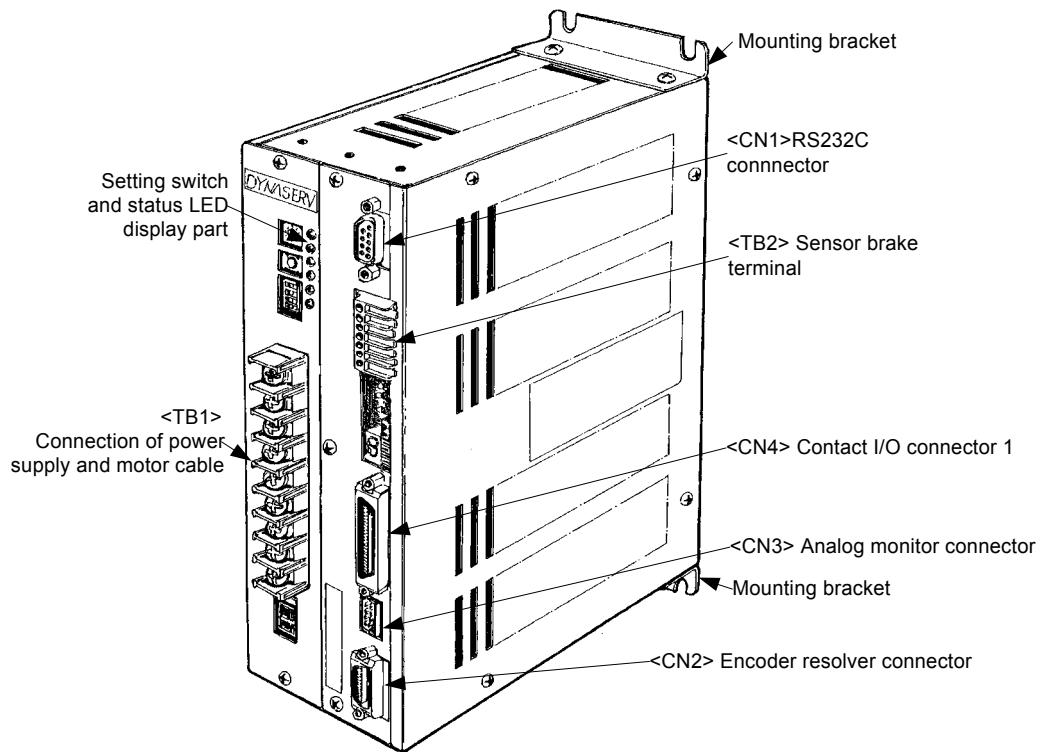
(1) Motor Part



(2) Driver part

■ 500W level

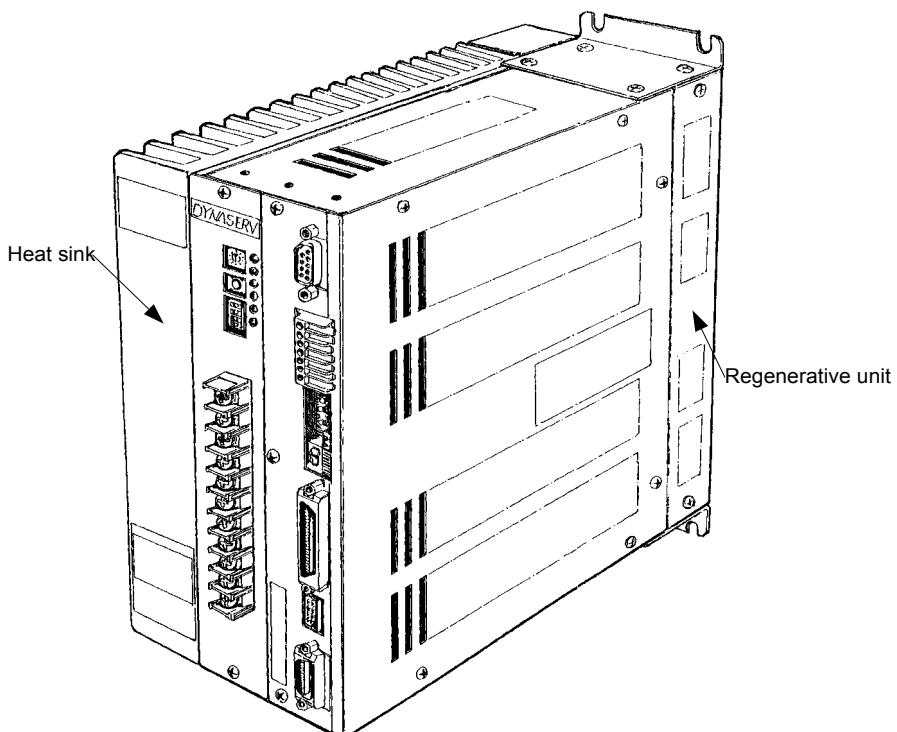
(A model with regenerative terminal is shown)



1

■ 2kW level

(A model with a regenerative terminal is shown)



1 Overview of the Product

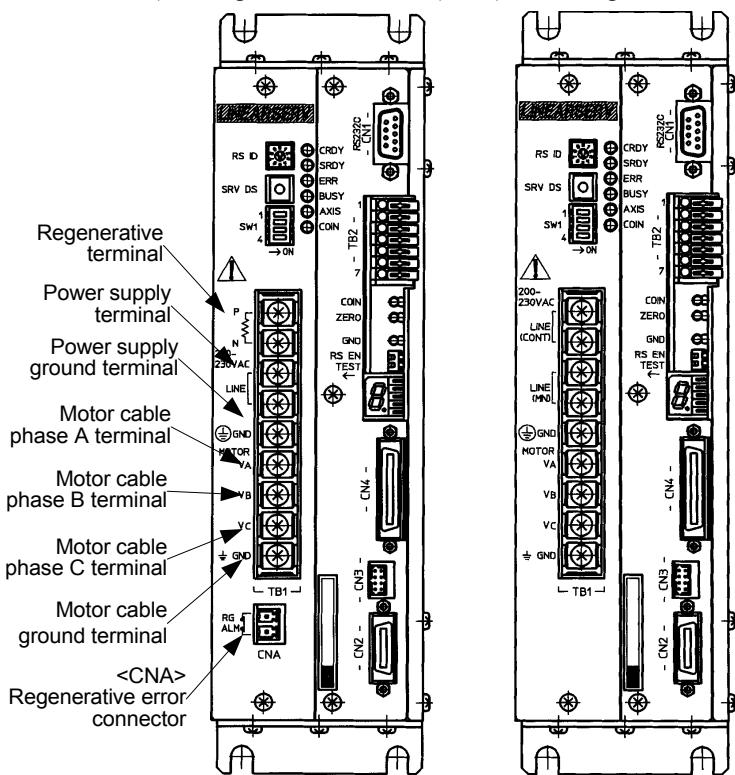
(3) Details of the Front Panel of the Driver

■500W level

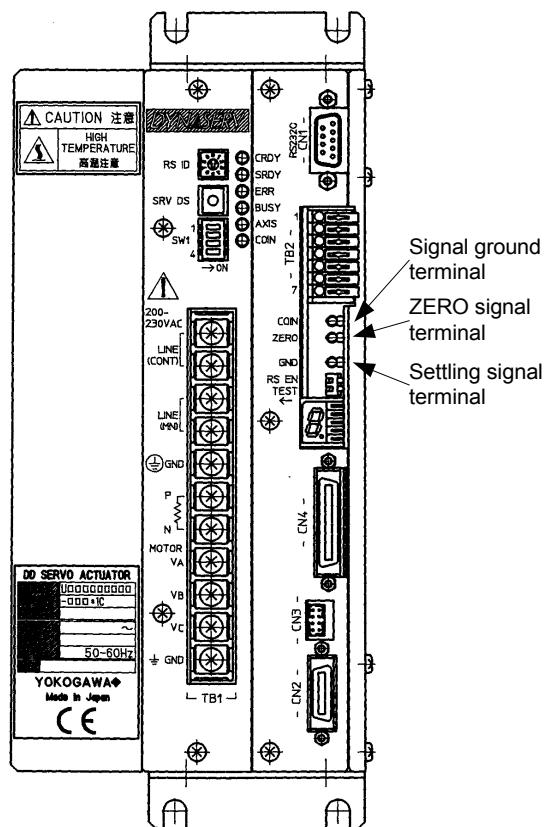
(with regenerative terminal)

■500W level

(without regenerative terminal)



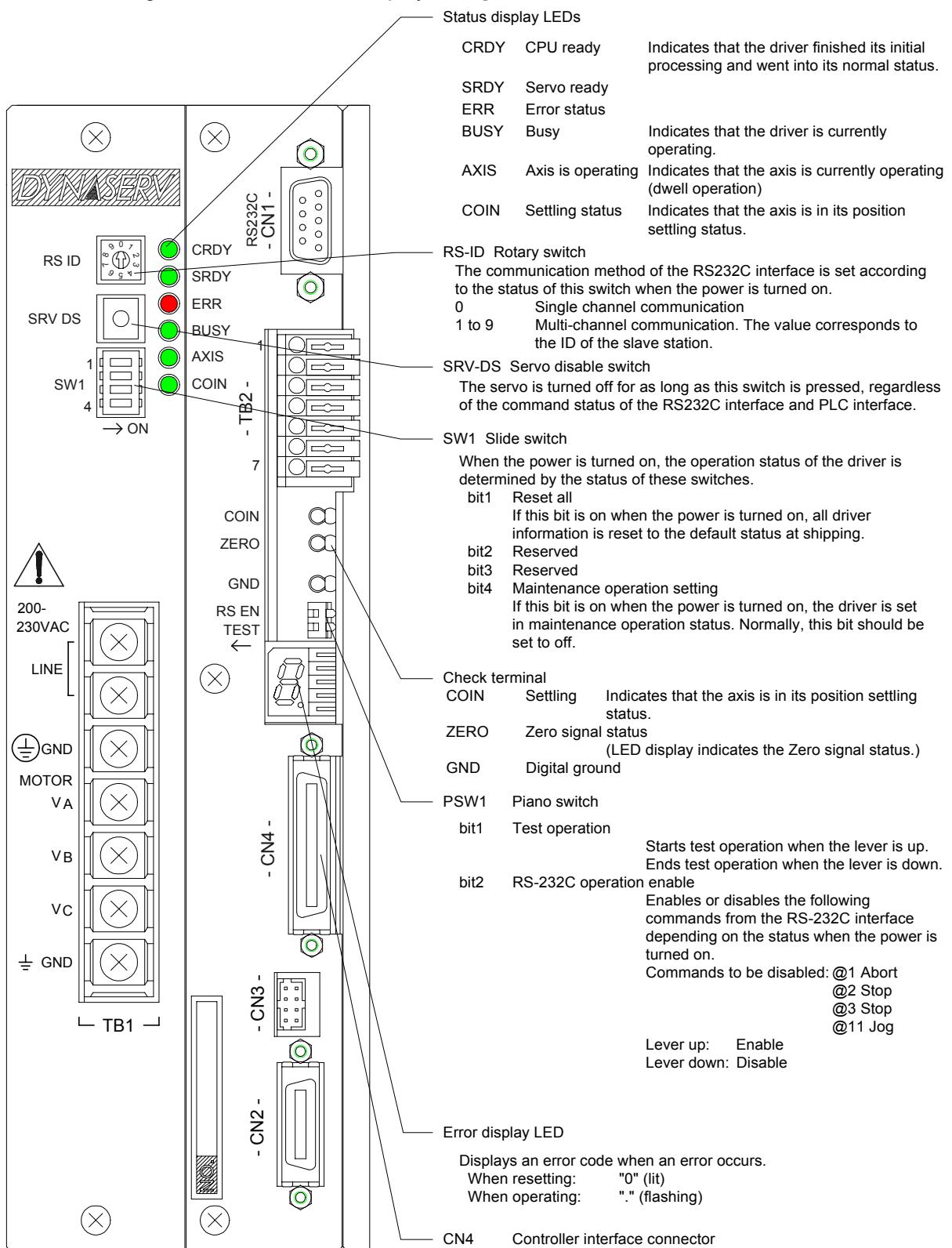
■2kW level



Note: (1) All the items shown are of the contact I/O type.

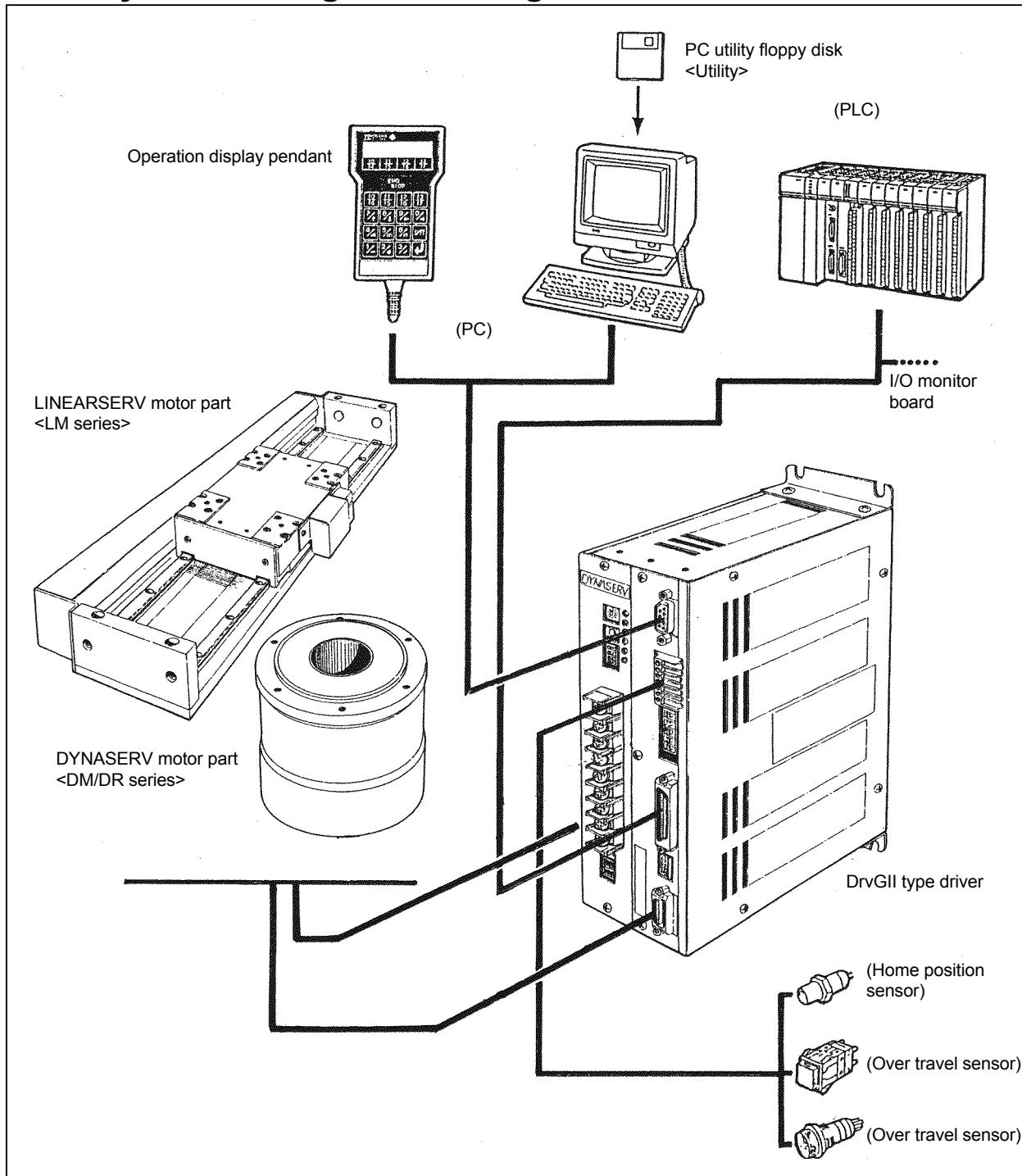
(2) The power supply ground terminal and the motor cable ground terminal are connected within the driver chassis.

[Details of Setting Switches and Status Display LEDs]



1 Overview of the Product

1.6 System Configuration Diagram



Note: The allowable combinations between the DYNASERV motors and the DrvGII drivers are as follows.

- (1) The 500W level driver can only be used with the DM1004B/1004C.
- (2) All other DM and DR series should be used with the 2kW level driver. Note that they cannot be used with the 500W level driver.

Chapter 2

Installation

- 2.1 Installation of the Motor**
- 2.2 Installation of the Driver**

2 Installation

When you receive the product, verify the model name and code of the product's main unit, whether all the standard accessories are included, and that the combination of a motor and a driver is correct before you begin installation and wiring.

2.1 Installation of the Motor

The motor part can be installed and used in either a horizontal or a vertical position. However, if installed in a wrong way or position, the life of the motor may be shortened or the motor may fail. Always follow the instructions explained below.

(1) Installation Position

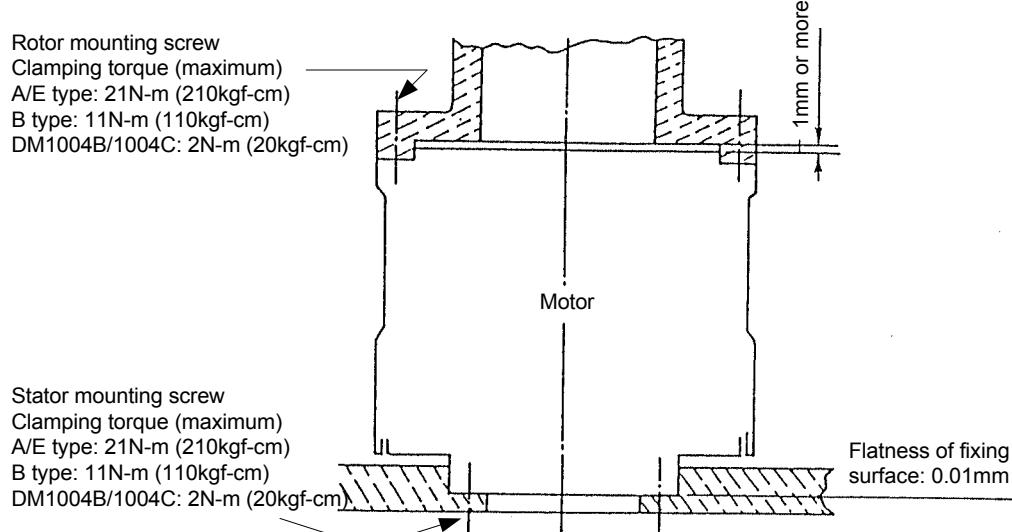
The motor part is designed based on the assumption that it is used indoors. Therefore, choose the location of installation so that it satisfies the following conditions:

- It should be indoors and not in a place where it can be exposed to corrosive and/or volatile gases.
- The ambient air temperature should be from 0 to 45 °C.
- There should not be too much dust or particles, the ventilation should be good, and the humidity should be low.

Note: The DYNASERV is not drip- or water (oil)-proof. If it is used in such an environment, a proper drip- or water (oil)-proof cover should be applied.

(2) Mechanical Installation

- When installing a load on the rotor of the motor, make sure to secure a clearance of 1 mm or more between the upper surface of the motor and the installed part in order to maintain the surface accuracy.
- The clamping torque of the screws used to install the rotor and stator of the motor should be equal to or less than the value indicated below.
- The surface flatness where the motor is fixed should be 0.01 mm or less.



Note: When tightening the screws, make sure to apply a screw lock using Loctite 601 or equivalent product.

2.2 Installation of the Driver

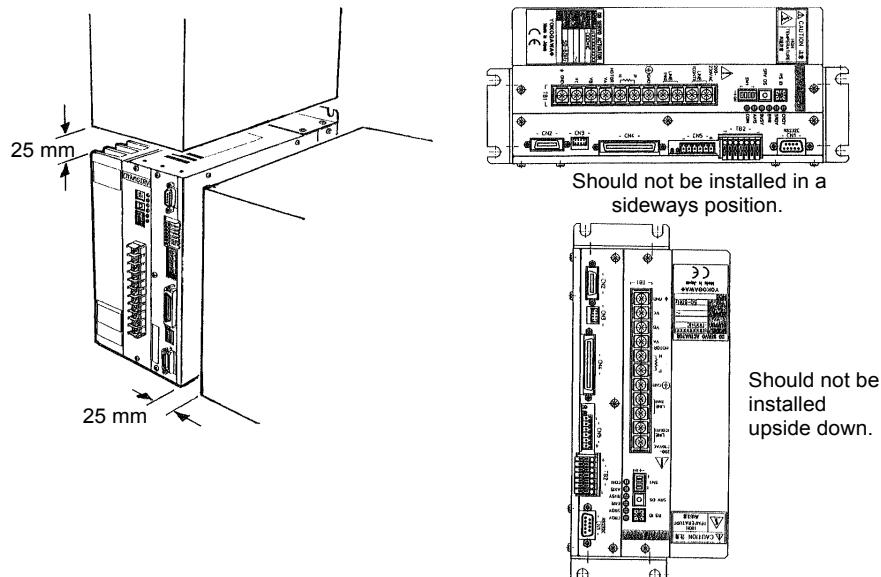
The standard installation method for the driver is either to mount it on a rack or a wall.

(1) Installation Position

- If there is a heating source near by, the temperature should be prevented from increasing by installing a shielding cover, etc.; the temperature around the driver should not exceed 50 °C (Note 1).
- If there is a source of vibration near by, the rack should be installed via a vibration absorption material.
- In addition to the above, it should be avoided to install the driver in surroundings that are high in temperature and humidity, filled with dust, metal powder, corrosive gas, etc.

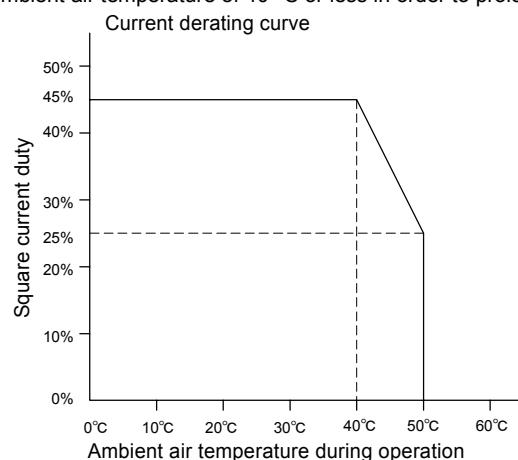
(2) Installation Method

- The standard way of installation is to install the driver on a rack, aligning the top and bottom with the front panel in the front. Do not put the panel surface into a sideways position or upside down (see the figure below).
- The driver box employs a natural air ventilation system. Make sure to secure space for ventilation above and below (25 mm or more) and right and left (25 mm or more) (see the figure below).
- Make sure to use the installation holes (four places) of the upper and lower brackets at installation.



2

(Note: 1) 2 kW level drivers, but not other types, will have the current characteristics shown in the graph below as a function of the ambient air temperature during operation. Therefore, it is recommended to use the driver in an ambient air temperature of 40 °C or less in order to prolong its life.



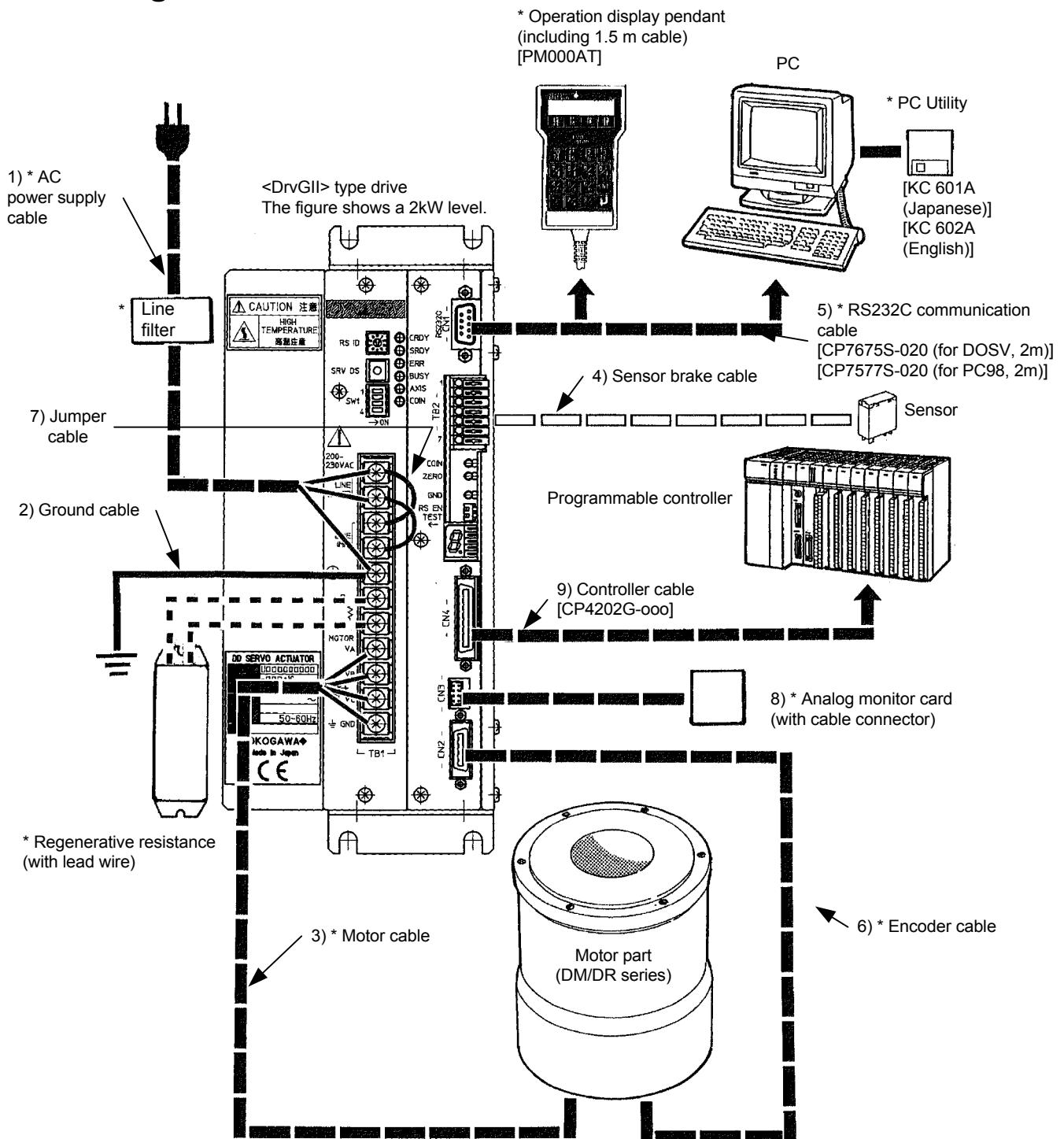
Chapter 3

Connection and Wiring

- 3.1 Diagram of Overall Connection
- 3.2 Cable Specification List
- 3.3 Connection between Motor and Driver
- 3.4 Wiring of Motor, AC Power Supply, and Ground Cable
- 3.5 Wiring of Encoder Cable
- 3.6 Wiring of Controller Cable
- 3.7 Wiring of Sensor Brake Terminal
- 3.8 Wiring of Regenerative Alarm Contact <CNA>
(For 500W Level Drive Only)

3 Connection and Wiring

3.1 Diagram of Overall Connection



* Optional parts (see separate wiring section for motor and encoder cables.)

3.2 Cable Specification List

	Cable name	Electric cable size	Driver	Current (A)
1)	AC power supply cable	2.0 mm ² or more, 30 m or less in length	TB1	*
2)	Ground cable (power supply)	2.0 mm ² or more	TB1	*
3)	Motor cable	2.0 mm ² or more, 30 m or less in length	TB1	*
4)	Sensor brake cable	0.3 to 0.75 mm ²	TB2	
5)	RS232C communication cable	Dedicated cable is required.	CN1	
6)	Encoder resolver cable	0.2mm ² twisted pair, batch shielded cable, outer diameter ϕ 14 mm or less, 10 m or less in length	CN2	Maximum 100 mA DC
7)	Jumper cable	2.0 mm ² or more	TB1	*
8)	Analog monitor card	Dedicated cable is required. [R7033YB] (cable with connector)	CN3	
9)	Controller cable	0.2 to 0.5mm ² , batch shielded cable, outer diameter ϕ 9 mm or less, 3 m or less in length	CN4	Maximum 500 mA DC

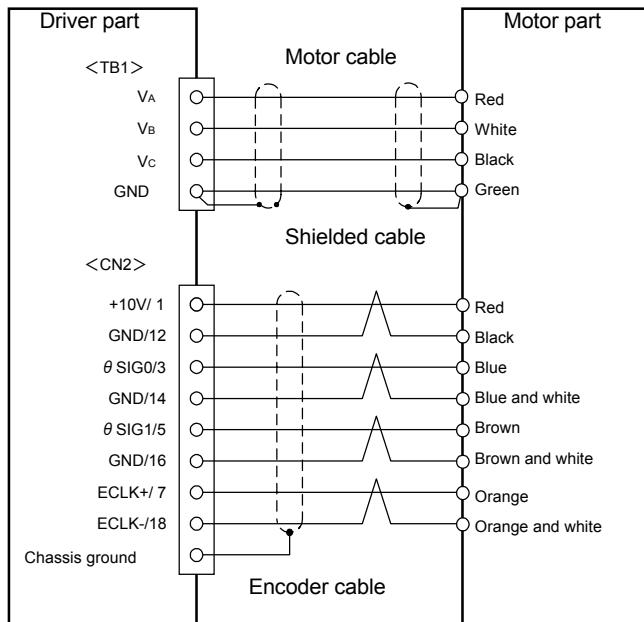
* 20A for the A (ϕ 264mm) and E (ϕ 205mm) types for both the DM and DR series
15A for the B (ϕ 160mm) type, and 10A for the DM1004B/1004C motors

3 Connection and Wiring

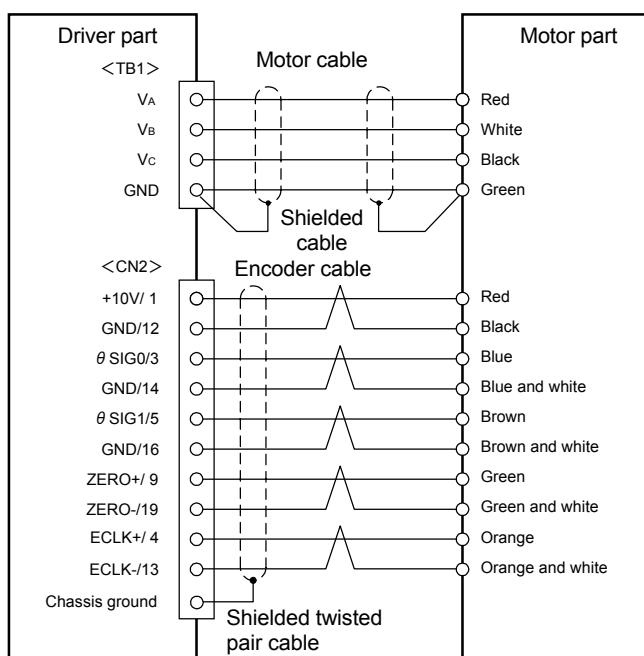
3.3 Connection between Motor and Driver

Note: Shielding should be applied to each wire.

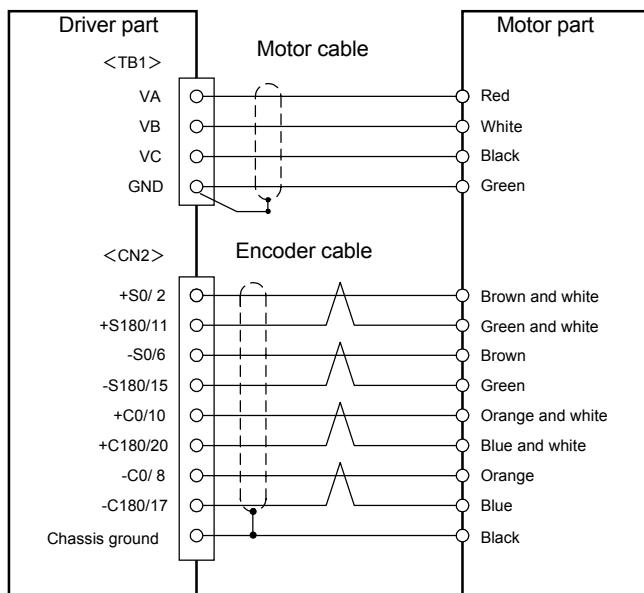
(1) DM Series (DM1004B/1004C) motors



(2) DM Series motors (models other than the above)



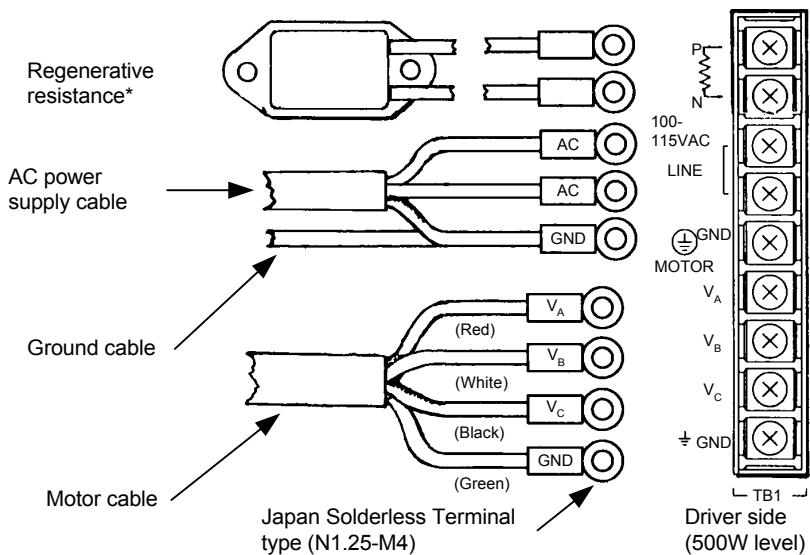
(3) DR Series motors



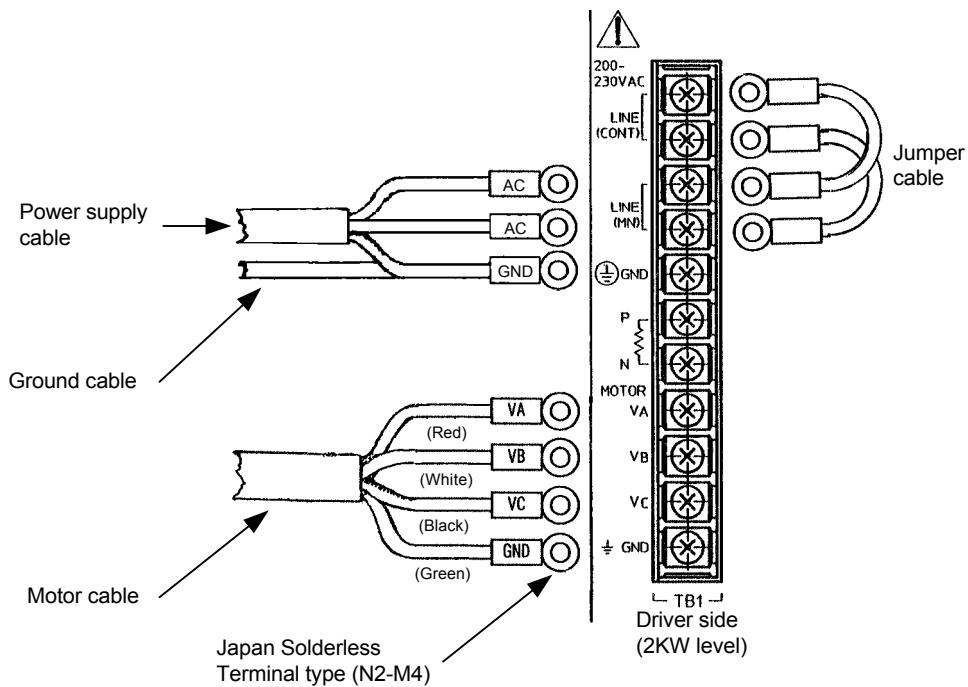
3 Connection and Wiring

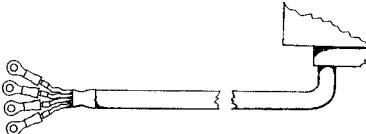
3.4 Wiring of Motor, AC Power Supply, and Ground Cable

- (1) For the DM1004B/1004C motors (in connection with a 500W level driver)
* In the case shown, a regenerative resistance is required.



- (2) For other DM/DR series (other than above) (in connection with 2kW level driver)



Cable	Specification	
	DM1004B/1004C	Other DM/DR series
AC power supply cable	■ 0.5 mm ² or more, 30 m or less in length	■ 2.0 mm ² or more, 30 m or less in length
	■ Clamping torque of terminal: 12[kgf·cm ²](1.18[N·m]) (terminal screw: M4x0.7)	
	■ Power supply filter, recommended part: Tokin Corporation #LF-200 series	
Motor cable	■ 0.5 mm ² or more, 15 m or less in length	■ 2.0 mm ² or more, 30 m or less in length
	■ Optional cable: CM6000C-□□□	■ Optional cable: CM300M-□□□ or CM0300R-□□□
		
Ground cable	■ 0.5 mm ² or more (use as thick cable as possible)	■ 2.0 mm ² or more (use as thick cable as possible)
	■ Third grade ground (ground resistance 100Ω or less)	
Jumper wire		■ 2.0 mm ² or more
Regenerative resistance*	For 100V: 80W 60Ω	
	For 200V: 80W 200Ω	

* Only for models with regenerative resistance (500W level)

3 Connection and Wiring

3.5 Wiring of Encoder Cable

(1) DM1004B/C motor

Pin #	Signal name	Pin #	Signal name
1	+ 10 V	11	-
2	-	12	GND
3	θSIG 0	13	-
4	-	14	GND
5	θ SIG 1	15	-
6	-	16	GND
7	ECLK+	17	-
8	-	18	ECLK-
9	-	19	-
10	-	20	-
Chassis ground		Shielded cable	

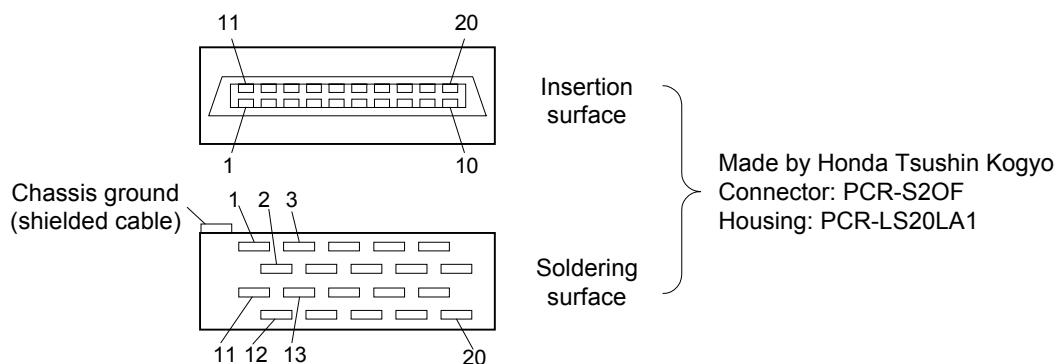
(2) DM series motor
(other than the one described to the left)

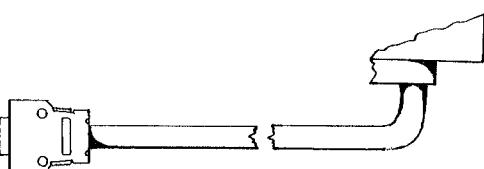
Pin #	Signal name	Pin #	Signal name
1	+ 10 V	11	-
2	-	12	GND
3	θSIG 0	13	ECLK-
4	ECLK+	14	GND
5	θSIG 1	15	-
6	-	16	GND
7	-	17	-
8	-	18	-
9	ZERO+	19	ZERO-
10	-	20	-
Chassis ground		Shielded cable	

(3) DR series motor

Pin #	Signal name	Pin #	Signal name
1	-	11	+S180
2	+S0	12	-
3	-	13	-
4	-	14	-
5	-	15	-S180
6	-S0	16	-
7	-	17	-C180
8	-C0	18	-
9	-	19	-
10	+C0	20	+C180
Chassis ground		FG Shielded cable	

Terminal for <CN2>



Electric wire specification	■ 0.2 mm ² multiple-core <u>twisted pair</u> batch shielded cable, 30 m or less in length*	
Optional cable		
	DM1004B/C	DM series motor (other than the ones described to the left)
	CE7900C-□□□	DR series motor
	CE7900M-□□□	CE7900R-□□□

* Within 10 m only for small-diameter/flat types (DM1004B/C).

3.6 Wiring of Controller Cable

<CN4> terminal

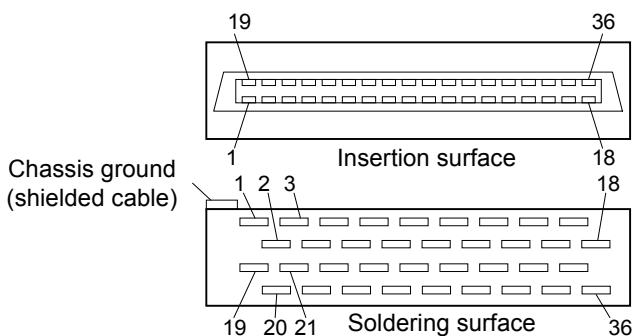
Pin #	Signal name	Pin #	Signal name	Pin #	Signal name	Pin #	Signal name
1	COMP1	10	UA_OUT-	19	IN_ERR_RESET	28	IN_FN
2	COMM1	11	DB_OUT+	20	IN_SERVO	29	IN_PLS_DIRECT
3	OUT_DRDY	12	DB_OUT-	21	IN_MODE_START	30	IN_PACT
4	OUT_SRDY	13	Z_OUT+	22	IN_ABORT	31	(NC)
5	OUT_BUSY	14	Z_OUT-	23	IN_MODE.0	32	(NC)
6	OUT_XOVL	15	PUA_IN+	24	IN_MODE.1	33	CRNT_LMT_IN+
7	OUT_OVER	16	PUA_IN-	25	IN_POSW.0	34	CRNT_LMT_IN-
8	OUT_COIN	17	SDB_IN+	26	IN_POSW.1	35	(NC)
9	UA_OUT+	18	SDB_IN-	27	IN_GAIN	36	(NC)

Terminal for <CN4>

Made by Honda Tsushin Kogyo

Connector: PCR-S36FS

Housing: PCR-LS36LA



3

Electric wire specification	<ul style="list-style-type: none"> ■ 0.2 to 0.5 mm² or more, multiple-core batch shielded cable, 3 m or less in length ■ Optional cable: CP4202G-□□□
-----------------------------	---

3 Connection and Wiring

3.7 Wiring of Sensor Brake Terminal

Pin #	Signal name
1	COMPO
2	XORG
3	XOTD
4	XOTU
5	(NC)
6	XBRKP
7	XBRKN

Electric wire specification	<ul style="list-style-type: none"> ■ 0.3 to 0.75 mm², electric wire coating with 10 mm of the core exposed at the tip ■ If a twisted wire is used, the diameter of the strand should be ϕ 0.18 or larger.
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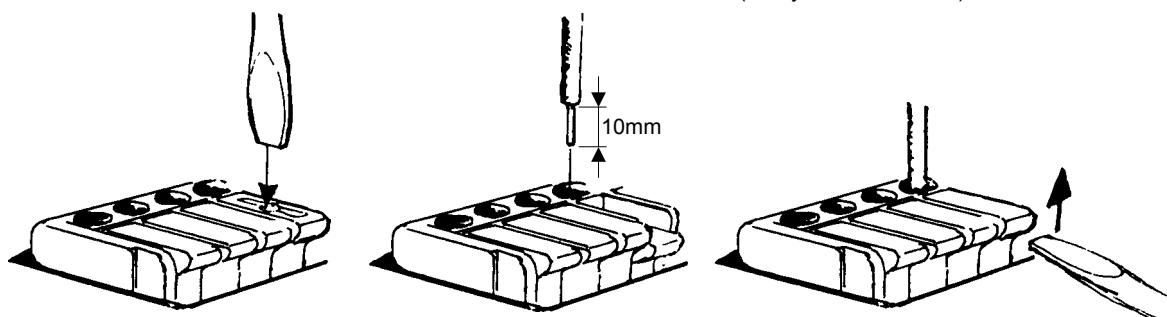
See the panel surface of the driver for the pin numbers.

<TB2> Made by Sato Parts (ML1900H)

1) Push down the lever with a screwdriver.

2) Insert the wire deeply.

3) Push up the lever
(until you hear the click)

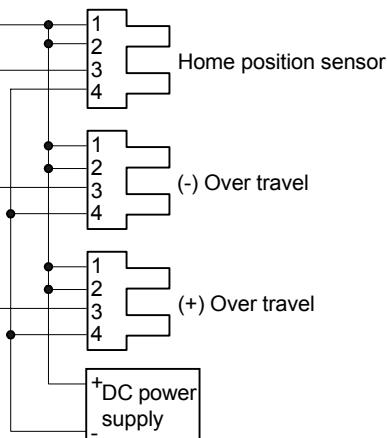


Example of sensor connection (sensor: EE-SX670 manufactured by Omron)

The recommended sensor logic is B contact.

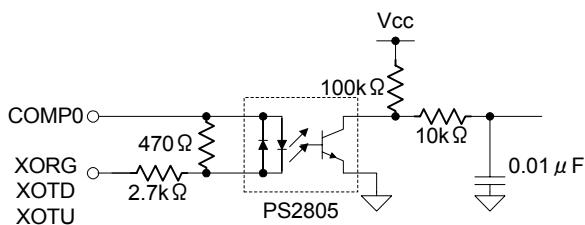
Set the sensor to OFF when the light is shielded. The sensor described above will be set to OFF when the light is shielded by the following result.

Signal name	Pin #
COMP0	1
XORG	2
XOTD	3
XOTU	4
(NC)	5
XBRKP	6
XBRKN	7



[Electrical specifications]

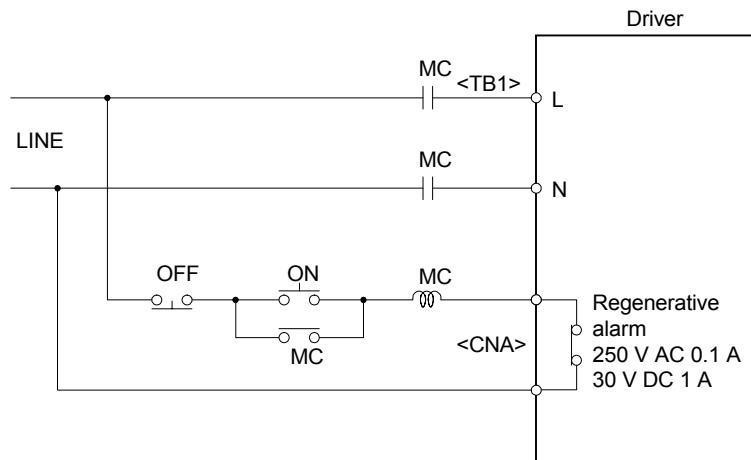
Input specifications	
Rated voltage	12~24VDC ($\pm 10\%$)
Rated input current	4.1 mA/point (at 12 VDC) 8.5 mA/point (at 24 VDC)
Input impedance	3.0k Ω
Operating voltage (relative to COMP*)	At OFF: 3.0 VDC or less At ON: 9.0 VDC or more
Allowable leakage current	OFF is guaranteed at 1.0 mA or less.



3.8 Wiring of Regenerative Alarm Contact <CNA> (For 500W Level Drive Only)

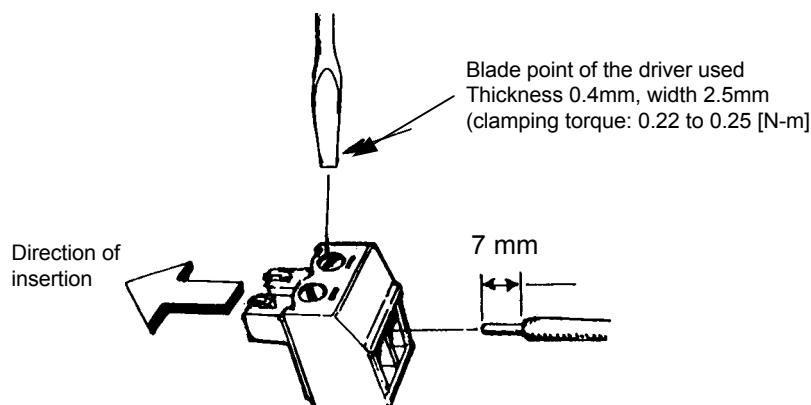
This driver (with regenerative terminal) is equipped with a regenerative circuit failure detection circuit. When connecting the regenerative circuit, build a sequence circuit as shown in the figure below in order to prevent burnout incidents.

Note: Build a sequence circuit so that it will turn off the power supply at alarm operation.



<CNA>

Made by Phoenix Contact
(plug: MC1, 5/2-ST-5, 08)



Chapter 4 Basic Settings for Operating the Motor

This chapter describes "Basic Settings," which should be used as the first step in understanding the "motor/driver/PC utility." The information is provided progressively, focusing on motor tuning, homing operation, and its setting method.

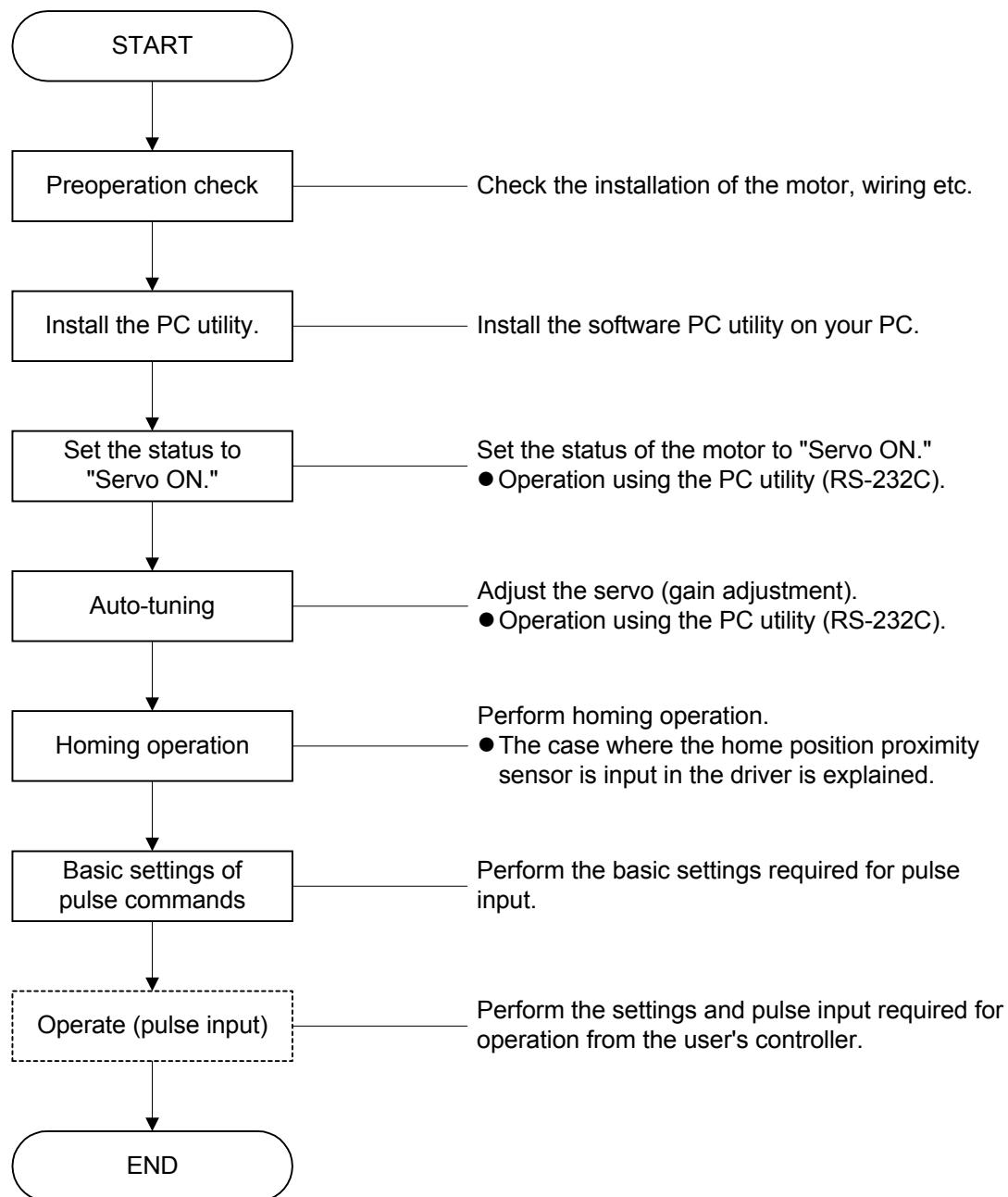
Make sure to perform the operations described in this chapter as a preliminary step before commencing device production.

- 4.1 Procedure (Flowchart)
- 4.2 Preoperation check
- 4.3 Installing the PC Utility on the PC
 - 4.3.1 Procedure
 - 4.3.2 Startup
- 4.4 Preparation
 - 4.4.1 Selecting Communication Port
 - 4.4.2 Selecting Channels
 - 4.4.3 Displaying Communication Strings
 - 4.4.4 Main Menu
- 4.5 Setting the Status to Servo ON
- 4.6 Auto-tuning
- 4.7 Performing Homing Operation
- 4.8 Performing the Basic Settings of Pulse Commands
 - 4.8.1 About Position Command Pulse Input
 - 4.8.2 Example of Operation

4 Basic Settings for Operating the Motor

4.1 Procedure (Flowchart)

In this section, we will operate the motor according to the procedure below.

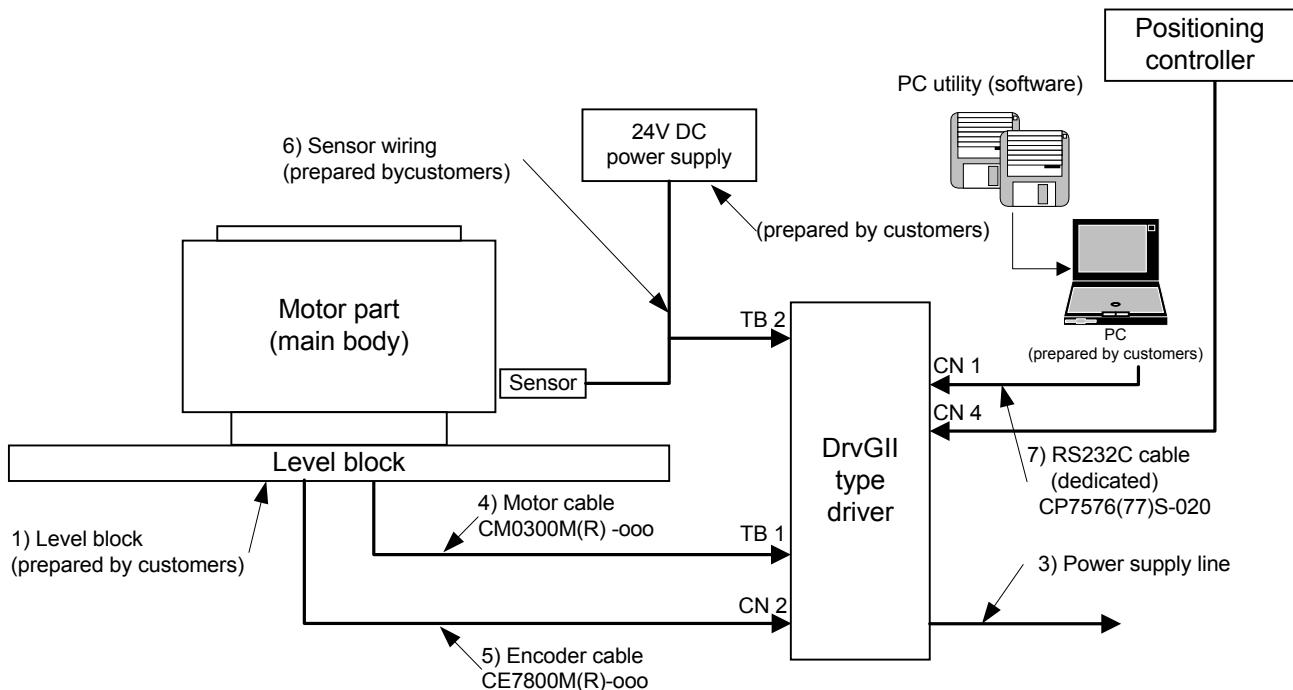


4.2 Preoperation check

(1) Items to prepare

- Motor unit/driver/sensor/DC power supply
- PC utility (floppy disk)
- Level block for fixing the motor
- PC (with Windows 95/98/98SE/Me/NT4.0/2000 installed)
- Various cables

(2) Installation and Wiring

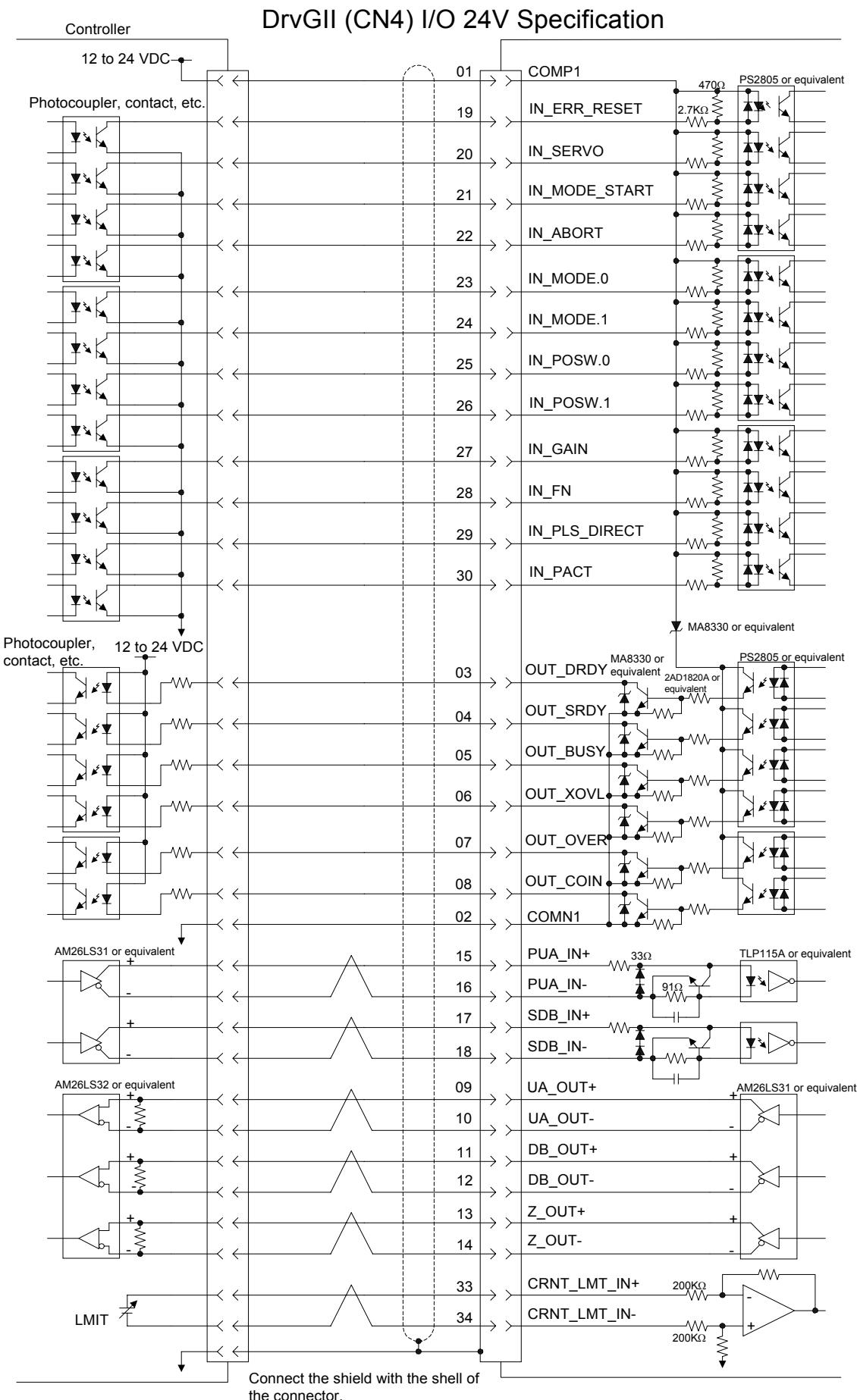


(3) Items to be checked

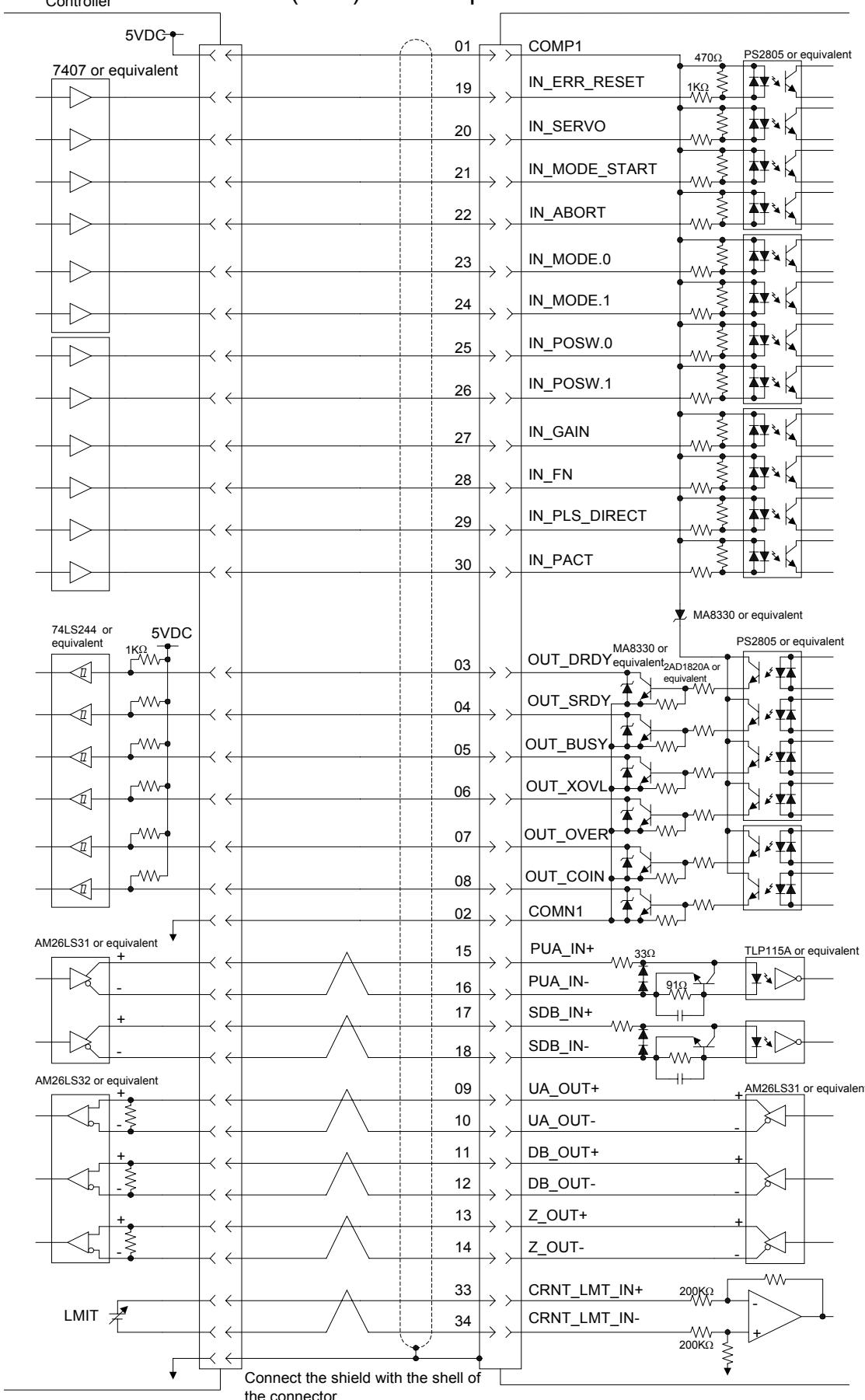
- 1) Is the main body fixed on the level block?
- 2) Is the motor not interfering with peripherals?
- 3) Is the power supply line wired properly? (LINE, GND)
- 4) Is the motor cable wired properly? (VA, VB, VC, GND)
- 5) Is the encoder cable wired properly?
- 6) Is the sensor wired properly?
(Home position, OT sensor: driver (or positioning controller))
- 7) Is the RS232C cable wired properly?
- 8) Is RS-232C operation enabled?
(Is bit 2 of PSW1 is on?)
- 9) Is the wiring with the positioning controller done properly?
(See a connection example on the following page.)

Check

4



DrvGII (CN4) I/O 5V Specification



4 Basic Settings for Operating the Motor

4.3 Installing the PC Utility on the PC

4.3.1 Procedure

Installation under Windows 95/98/98SE/Me/NT4.0/2000

The G2 PC utility (hereinafter referred to as the “PC utility”) runs on Windows 95, 98, 98SE, Me, WindowsNT4.0 and 2000. It can be installed via “Add/Remove Programs” under the “Control Panel” in Windows. If an older version of the PC utility is present, delete it first and then install the new version. Display the “Properties of Adding/Removing Programs” dialog box and click “**Set Up (1)**.” Then proceed according to the instructions displayed on the screen. The PC utility setup program starts up. Proceed with the setup according to the instructions on the screen. A dialog box for determining the directory in which to install the PC utility appears (see Figure 4.3.1).

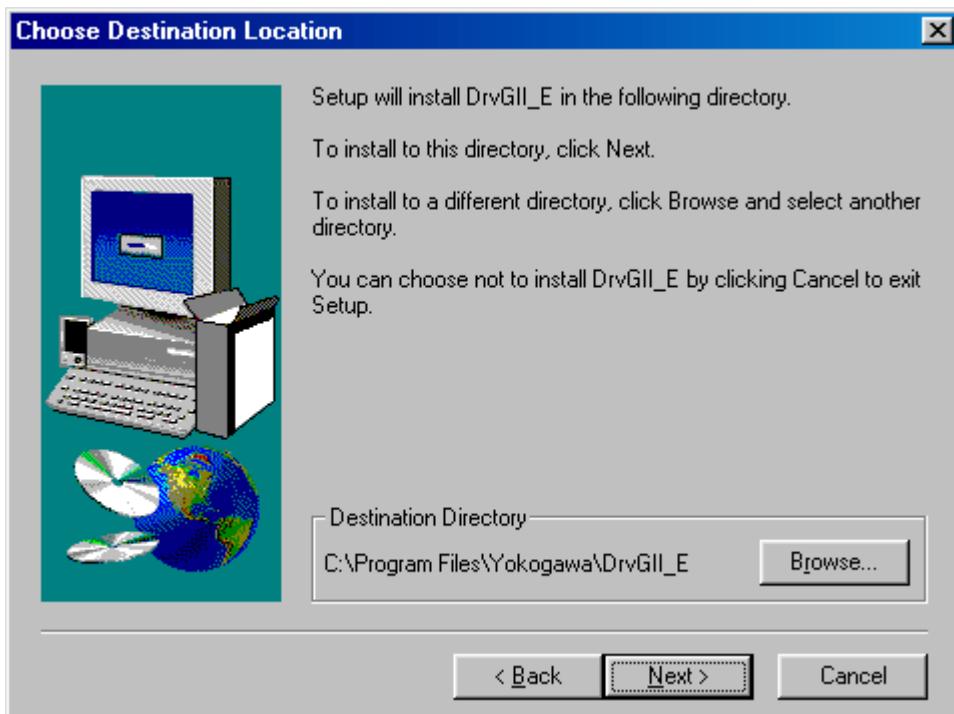


Figure 4.3.1 “Choose Destination Location” dialog box

Click “**Browse**” to display the “Select Directory” dialog box and select the desired drive and directory. Click “**Next**” to display “Select Program Folder” (see Figure 4.3.2).

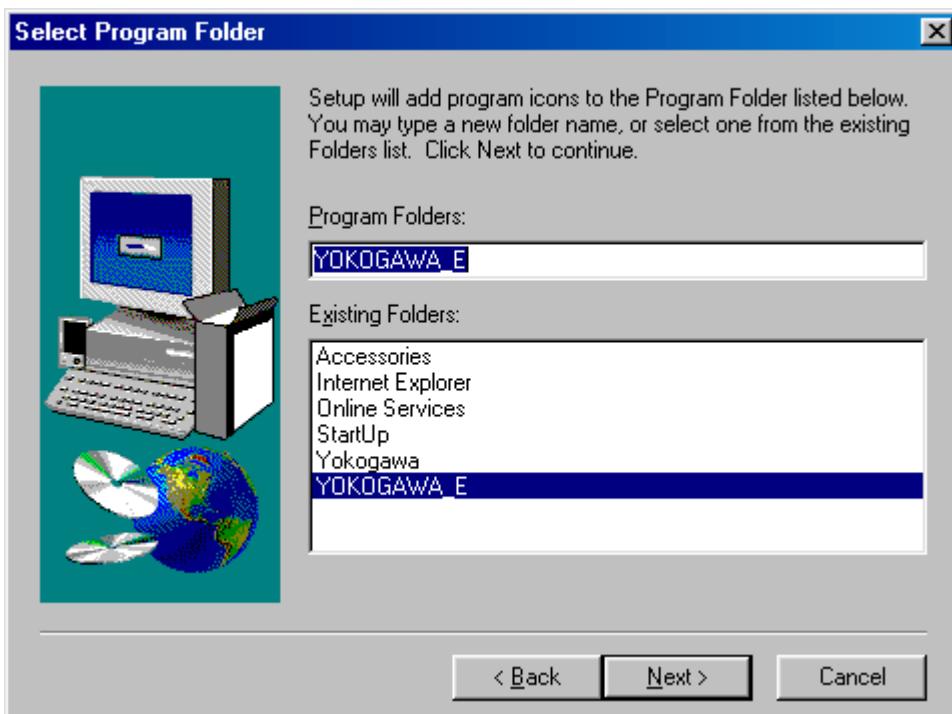


Figure 4.3.2 “Select Program Folder” dialog box

Select a program folder and click “*Next*.” The installation begins. Follow the instructions on the screen and change disks. When the setup is completed, the “Setup Complete” dialog box appear (see Figure 4.3.3).

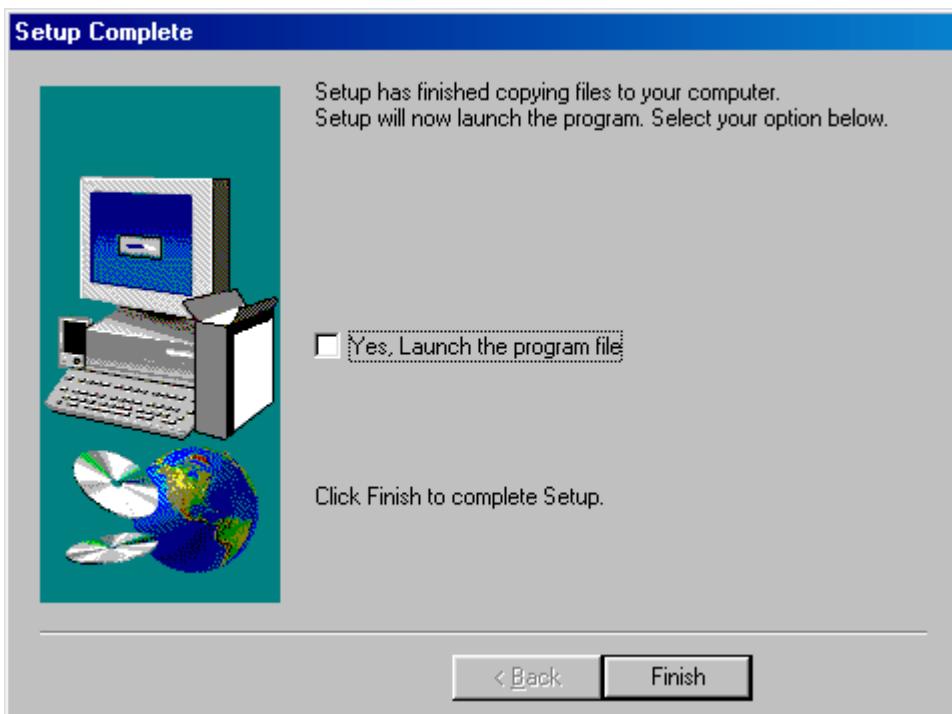


Figure 4.3.3 “Setup Complete” dialog box

To start the program, select “Launch the program file” and click “*Finish*.” If you do not want to start the program, just click “*Finish*.” If you are prompted to restart the computer, simply follow the message and restart it.

Note: Remove the floppy disk before restarting the computer.

4 Basic Settings for Operating the Motor

4.3.2 Startup

- To start the PC utility, click “Start,” “Program (P),” “YOKOGAWA_E” and then “DrvGII.”

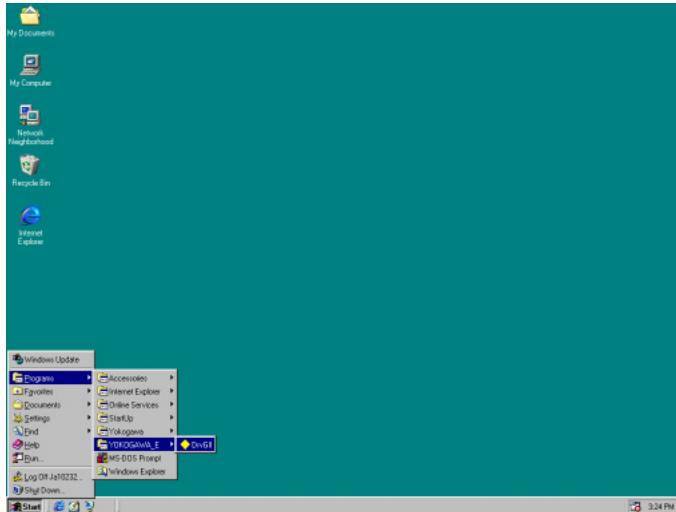


Figure 4.3.4 “Startup”

- An “Version Information” dialog box is displayed for several seconds and then the PC utility starts up.

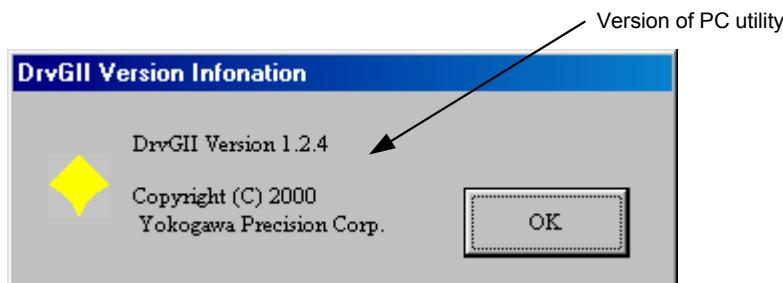


Figure 4.3.5 “Version Information” dialog box

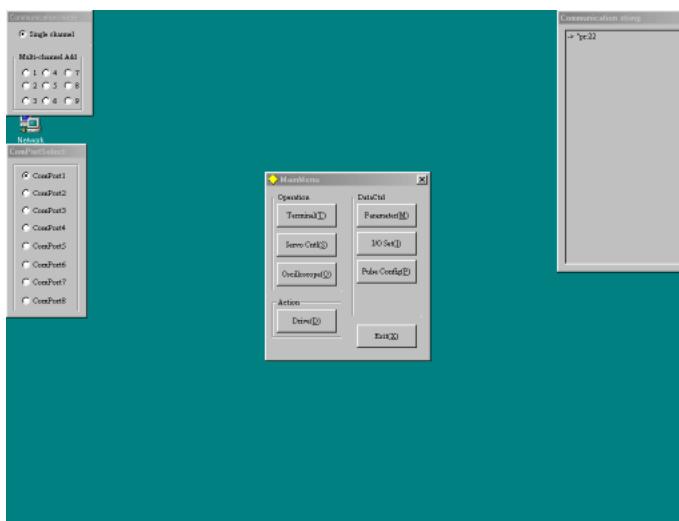


Figure 4.3.6 After starting up the PC utility

4.4 Preparation

Connect the serial port of the PC with the serial port of the driver with a dedicated cable.
(Do not use any of commercially available cables. Since 5V power is being output from the driver as the power supply for the operation display pendant, a breakdown may occur in the PC if such cable is used.)

4.4.1 Selecting Communication Port

When you start the PC utility, the “ComPortSelect” dialog box appears in the left side of the screen (see Figure 4.4.1). Change the setting according to the communication port of the connected PC.



Figure 4.4.1 “ComPortSelect” dialog box

Note: Settings made in the “ComPortSelect” dialog box are stored in a file. It is not necessary to make settings from the next time you start the PC utility. Change the setting as necessary.

4.4.2 Selecting Channels

When you start the PC utility, the “Communication mode” dialog box appears in the upper left corner of the screen (see Figure 4.4.2). If you are using one driver, select a single channel, and if you are using multiple drivers, select multi-channel addresses. (See Chapter 6 for how to make setting on the driver side.)



Figure 4.4.2 “Communication mode” dialog box

Note: The settings made in the “Communication mode” dialog box are not stored. When the PC utility is started up, a single channel is always set.

4 Basic Settings for Operating the Motor

4.4.3 Displaying Communication Strings

When you start the PC utility, the “Communication string” dialog box appears in the upper right corner of the screen. (See Figure 4.4.3.) Any strings that the PC utility sends to the driver as well as any strings received from the driver are displayed regardless of the menu.

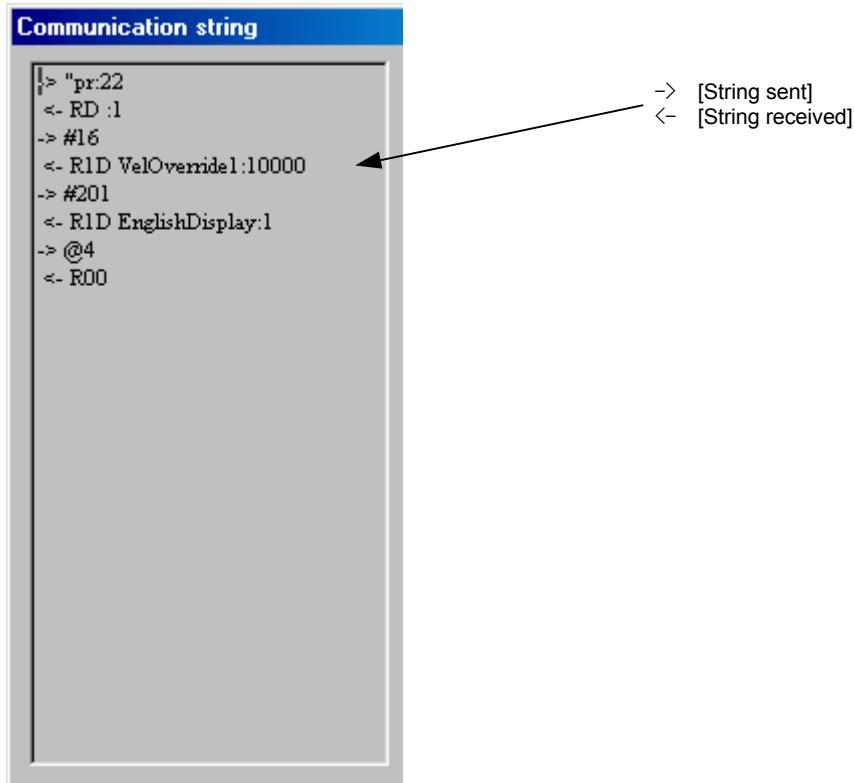


Figure 4.4.3 “Communication string” dialog box

4.4.4 Main Menu

When you start the PC utility, the “MainMenu” dialog box appears (see Figure 4.4.4). See the following chapters for how to start the actual operation.

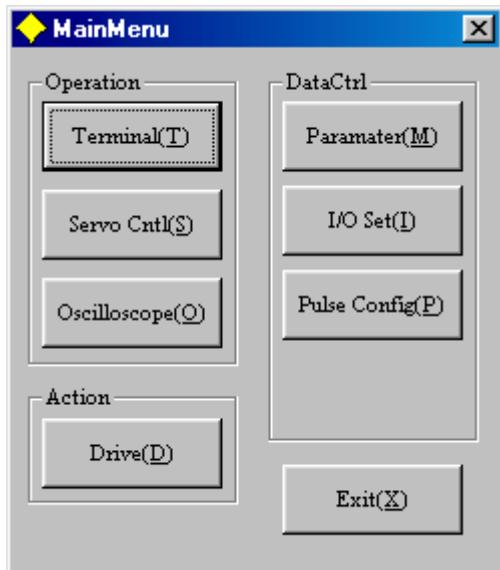


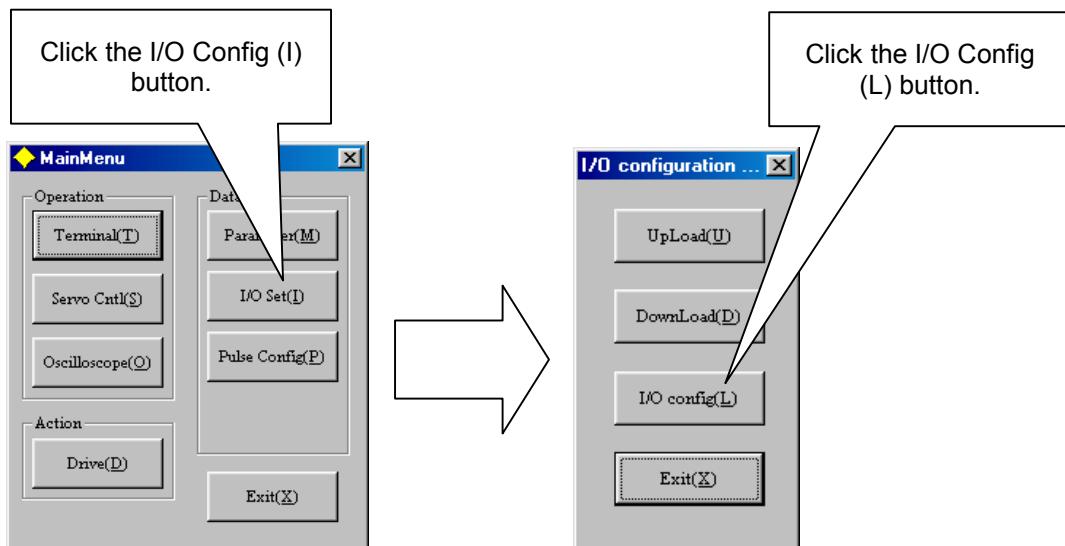
Figure 4.4.4 “MainMenu” dialog box

4 Basic Settings for Operating the Motor

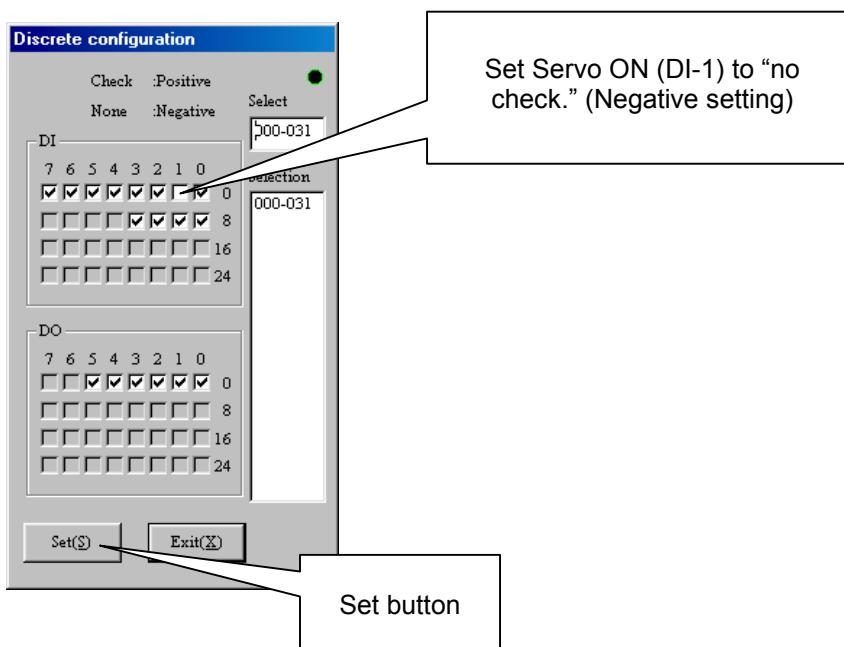
4.5 Setting the Status to Servo ON

The driver can be put into Servo On status through the following operation.

- (1) Click the “I/O Config (I)” button in the “MainMenu” and then the “I/O config (L)” button.

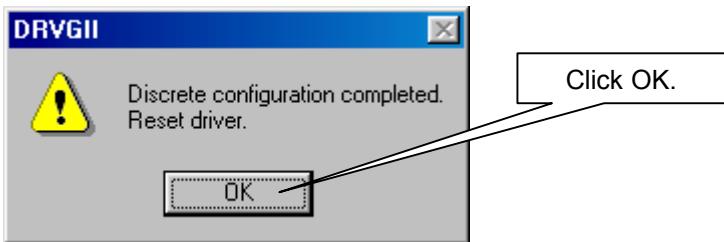


- (2) Enable Servo ON. Click the checkmark of “1” under DI and then click the Set (S) button.



Make sure to click the “Set” button after finishing the setting (the status will become Servo ON). Verify that the “S-RDY” LED on the front panel is turned on.

(3) Reset the driver according to the message in the dialog box.



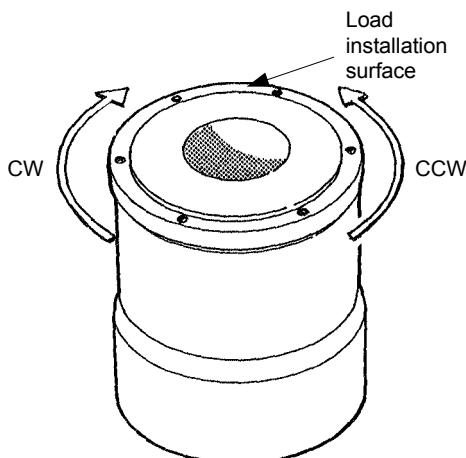
(4) Verify that the driver is reset and the “SRDY” LED on the front panel is turned on.

4 Basic Settings for Operating the Motor

4.6 Auto-tuning

The auto-tuning can be performed according to the following procedure.

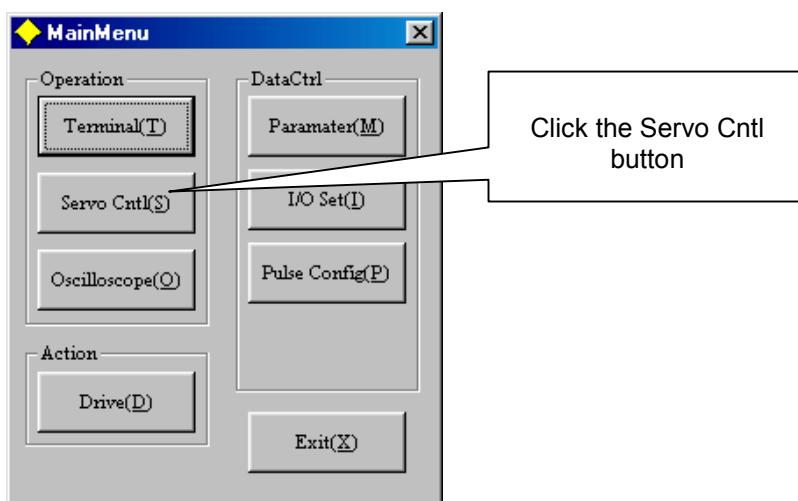
- (1) Checking the rotation direction
Check the rotation direction (CW/CCW) of the motor.



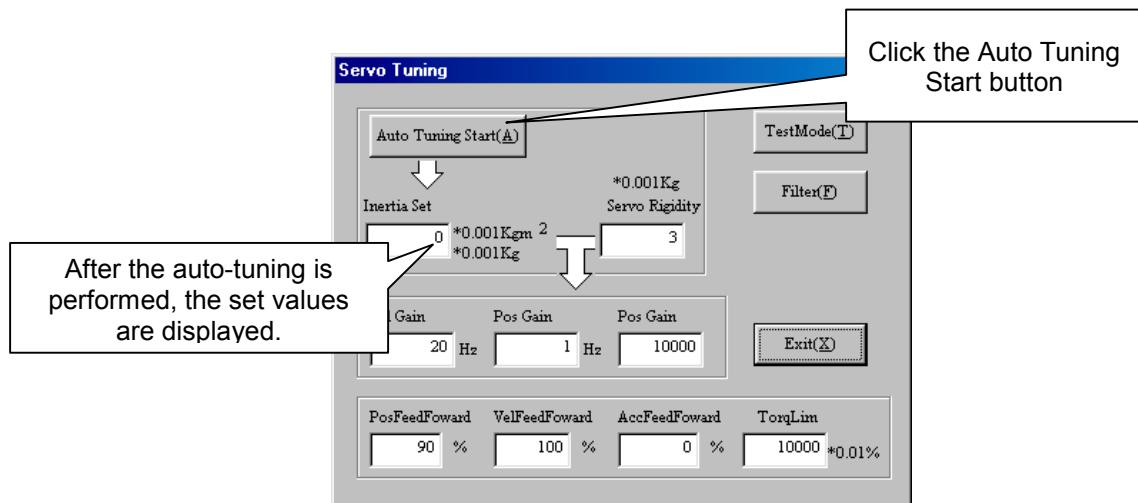
Caution

Look carefully from both sides of the load installation surface to check the CW/CCW movement. When started, the motor operates in the CCW direction. Take extra care to ensure that there is no mechanical interference with the rotor, which is currently in the stop position.

- (2) Click the “Servo Cntl (S)” button on the “MainMenu.”



- (3) Click Auto Tuning Start (tuning starts).
- (4) Follow the message on the dialog box and click “OK” to start the auto-tuning operation.



⚠ Caution

The rotor rotates a maximum of 30° (seven times of reciprocating operation) in the CW direction. The operation width varies depending on the velocity rating of the motor.
Take extra care not to cause any mechanical interference around the rotor.

<How to calculate the operation width>
Operation width (degree) = motor velocity rating [rps] x 0.02 x 360

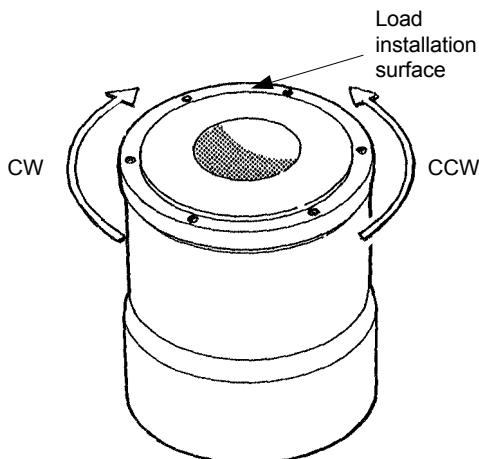
- (5) Each parameter setting value is displayed and the auto-tuning is automatically terminated.

4 Basic Settings for Operating the Motor

4.7 Performing Homing Operation

A homing operation can be performed according to the following procedure.

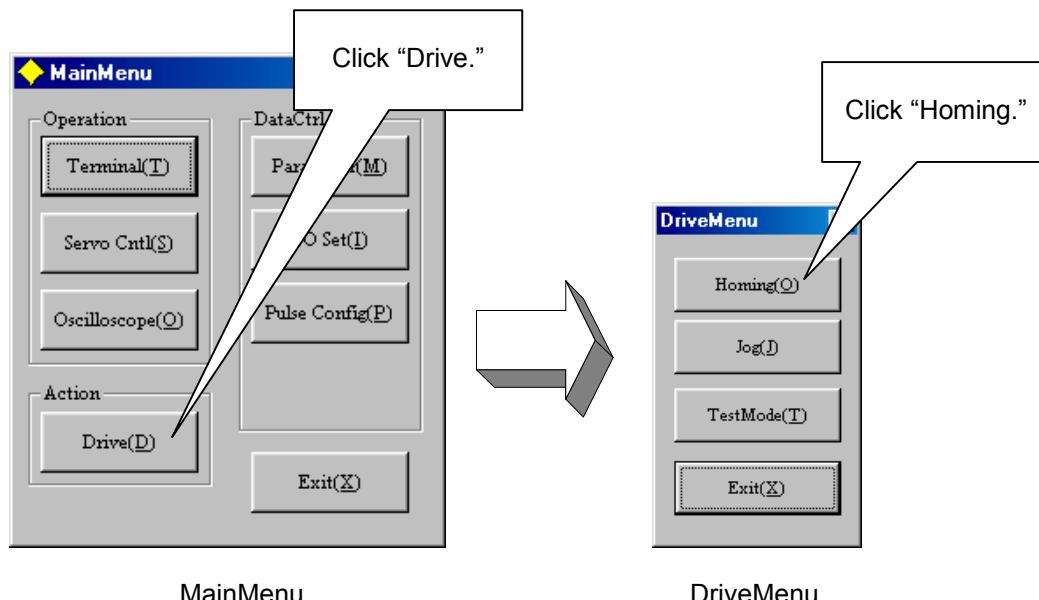
- (1) Checking the rotation direction
Check the rotation direction (CW/CCW) of the motor.



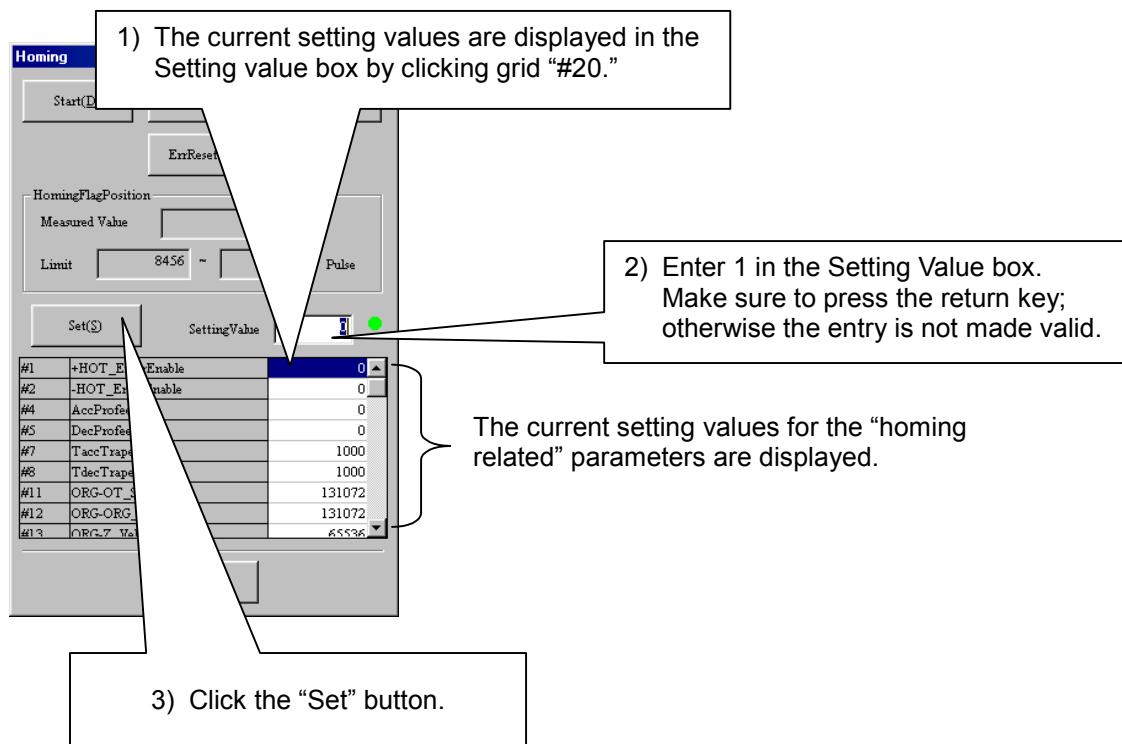
Caution

Look carefully from both sides of the load installation surface to check the CW/CCW movement. When started, the motor operates in the CCW direction. Take extra care to ensure that there is no mechanical interference with the rotor.

- (2) Check the setting of the homing direction through the PC utility.
Click "Drive" in the Main Menu, then "Homing."

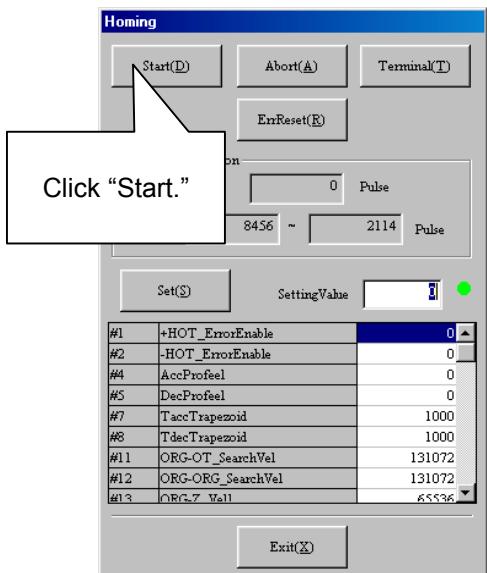


- (3) Set the “homing direction” in the “Homing” dialog box.



Caution The initial value that should be set depends on the homing direction. Enter "#20 = 1" if the homing direction is CW and "#20 = 0" if it is CCW.

- (4) Click the “Start” button to start the homing operation.



4

- Caution** 1) The homing operation finishes automatically after the operation is completed. In the event of

- The homing operation does not finish, and

• The motor does not stop even when the home position sensor is detected,

Click “Abort (A)” to stop the motor, then check “wiring” and “auto-tuning” again.

- 2) If a homing abnormality message is displayed, follow the message to adjust the flag position using the limit value as a guideline. If an error occurs, press “ErrReset” as well.

4 Basic Settings for Operating the Motor

4.8 Performing the Basic Settings of Pulse Commands

4.8.1 About Position Command Pulse Input

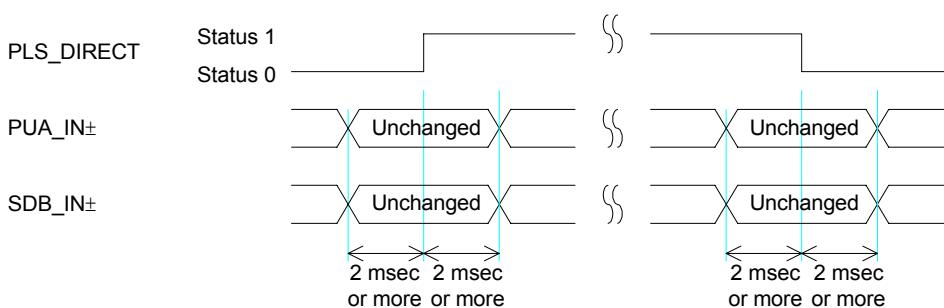
Perform input (pulses) required for operation according to the explanation in Section 6.2, “Position Command Pulse Input” in Chapter 6, “Controller Interface.” Prior to performing pulse input, be sure to perform required settings according to the explanation in Section 6.1, “Terminal Function.”

The position command value instructed from the controller interface is given to the driver by any pair of the (PLS, SIGN), (UP, DOWN) and (A, B) signals, which is then reflected in the command unit command value. Which pair of the signals will be used to give a command is set with the #204 *Command pulse type* parameter.

	(PLS, SIGN)		(UP, DOWN)		(A, B)	
	+ direction	- direction	+ direction	- direction	+ direction	- direction
PUA_IN \pm	PLS	150ns min	UP	150ns min	A	
SDB_IN \pm	3μs min	3μs min	SIGN	DOWN	B	300ns min
Caution	The signal should be H when active (status for flowing current to the driver photocoupler). As for the PLS, it should be L when normal.		The signal should be H when active (status for flowing current to the driver photocoupler). As for both the UP and DOWN, they should be L when normal.		The signal should be H when active (status for flowing current to the driver photocoupler).	

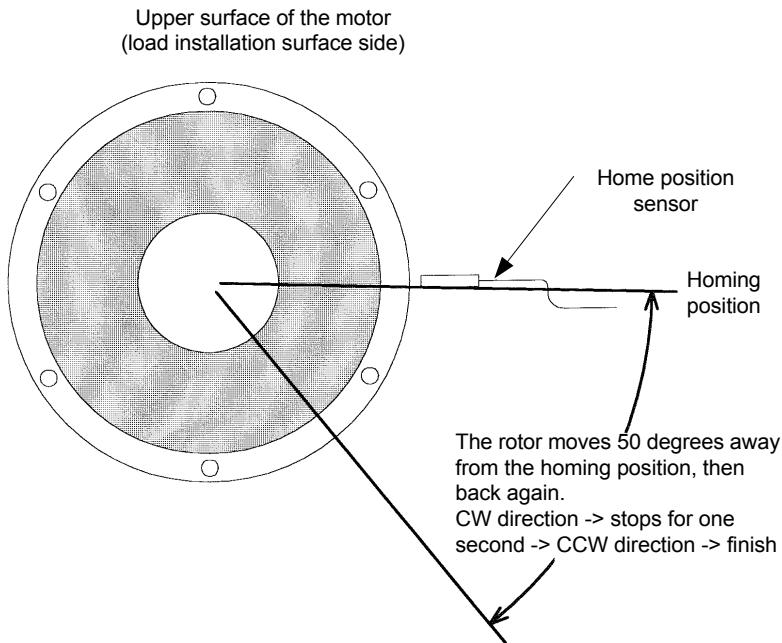
The position command value instructed from the controller interface can change the weight of a single pulse on the interface by the input signal “PLS_DIRECT.” When the status of the input signal “PLS_DIRECT” is 0, a single pulse on the interface becomes the value set with the #207 *Simplified scaling weighted data* parameter. While the status of the input signal “PLS_DIRECT” is 1, a single pulse on the interface is independent of the value set with the #207 *Simplified scaling weighted data* parameter, and becomes a single pulse inside the driver.

However, do not change the status of any of the (PLS, SIGN), (UP, DOWN) and (A, B) signals for 2 msec each before and after switching the input signal “PLS_DIRECT” (off → on, on → off).

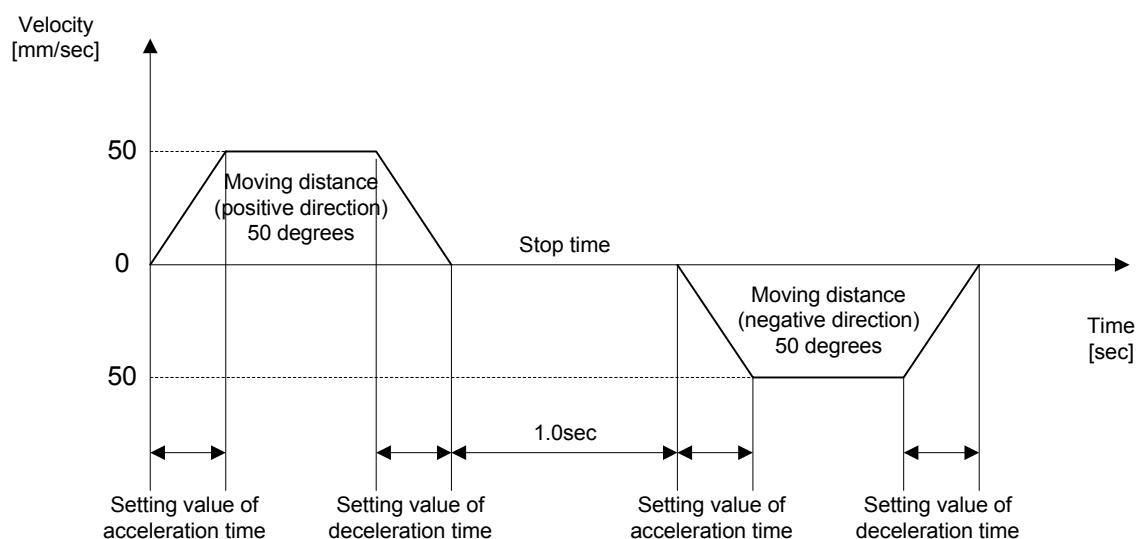


4.8.2 Example of Operation

The following shows an example of operation. Input pulses from the positioning controller according to the velocity pattern shown below.



<Velocity pattern : Example of operation>



Chapter 5

Functions

5.1 Parameters and Monitors

- 5.1.1 General Parameters
- 5.1.2 Mechanical Setting Parameters
- 5.1.3 Monitors

5.2 Operation Functions

- 5.2.1 Jog Move
- 5.2.2 Test Operation
- 5.2.3 Auto-Tuning Operation
- 5.2.4 Homing Move
- 5.2.5 Mechanical Setting Mode

5.3 Coordinate System

- 5.3.1 Coordinate System
- 5.3.2 Switching Position Command Pulse Weights

5.4 Control System

- 5.4.1 Velocity Control Part
- 5.4.2 Position Control Part
- 5.4.3 Feed Forward
- 5.4.4 Servo Stiffness Parameter

5.5 Acceleration/Deceleration Function

- 5.5.1 Velocity Override Function
- 5.5.2 Velocity Profile

5.6 Other Functions

- 5.6.1 Settling Wait, Position Settling Status, and Positioning Status
- 5.6.2 Velocity Monitor and Analog Monitor
- 5.6.3 Brake Signal

5.7 Special Parameter Processing

- 5.7.1 Internal Generation of Parameter Initial Values
- 5.7.2 Limiting and Checking Maximum Velocity When Changing Simplified Scaling Weighted Data and Maximum Velocity Parameters
- 5.7.3 Auto Conversion and Clear Functions When Changing Simplified Scaling Weighted Data
- 5.7.4 Limiting the Maximum Parameter Values

5 Functions

5.1 Parameters and Monitors

The group of variables expressed by #*** is called *parameters and monitors*. Parameters/monitors are classified according to their numbers as follows.

Parameter No.	Parameter type	Backup	Comments
0 to 199	General parameters	Stored	Always possible to read and write.
200 to 299	Mechanical setting parameters	Stored	Reading is always possible, but writing is possible only when operating in mechanical setting mode.
300 to 399	Monitors	-	Read only. Reading is always possible, but writing is not possible at any time.

By expressing all parameters/monitors by #***, their values can be referenced (read). It is also possible to change (write) the values within the range allowed for each parameter/monitor.

5.1.1 General Parameters

These parameters can be read and written at all times and an operational meaning is assigned to each. The details of each parameter will be explained separately.

Note that these parameters are stored in the driver; they will not be deleted even if the power is turned off.

5.1.2 Mechanical Setting Parameters

It is always possible to read these parameters, but writing is possible only when operating in mechanical setting mode. These parameters are set only once when the device is started up. An operational meaning is assigned to each. The details of each parameter will be explained separately.

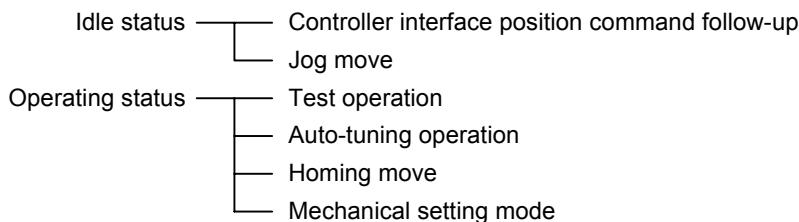
Note that these parameters are stored in the driver; they will not be deleted even if the power is turned off.

Note: If these parameters are changed during execution in mechanical setting mode, the changes made to the values will not be reflected until the power is turned on again. Therefore, please note that if you try to read a parameter value after you change the parameter, the value before the change is read until you turn the power off and on again.

5.1.3 Monitors

These variables are used to display the driver's status. Only reading is allowed at all times and each has an operational meaning. The details of each parameter will be explained separately.

5.2 Operation Functions



The status in which no operation is performed is called the *idle status*; jog moves can be performed in this status. If no jog move is being performed in the idle status, the driver follows the position command from the controller interface.

This driver is equipped with the operation functions listed below. Use them as needed.

The start, end, and stop actions of these operations can be controlled from either the controller interface side or the RS232C interface side. Refer to the related chapters (Chapter 6, "Controller Interface" and Chapter 7, "RS232C Interface") for operation methods.

The methods used to end each operation can be classified into three categories: the *self-end type* that ends automatically when the operation is complete, the *non-self-end type* that cannot end the action by itself, and the *non-end type* that cannot be stopped once started. An appropriate end or stop action must be performed for each type.

Operation No.	Name	Comment	Ending type
0	Test operation	Generates a 2.5Hz square wave position command signal for adjustment of the control part.	Non-self-end
1	Auto-tuning operation	Makes the rotor oscillate, measures load inertia and load mass, and sets the parameters for the control part automatically.	Self-end
2	(Reserved)		
3	Homing move	Finds the home position using the hardware over-travel signal, homing sensor, and motor Zero signal to establish the coordinate system.	Self-end
4 to 14	(Reserved)		
15	Mechanical setting mode	Special mode for changing mechanical setting parameters.	Non-end

5.2.1 Jog Move

The rotor can be moved in the positive (+) or negative (-) direction by issuing a jog move command while in idle status.

There are three types of jog move commands: *(+) direction move*, *(-) direction move*, and *stop*. Refer to the sections about the RS232C interface and PLC interface for how to issue a command.

The move can only be trapezoidal but it is possible to set the acceleration and deceleration profile. In addition, the velocity override does function in real time. The velocity in the jog move is determined by the value in the **#10 Jog Velocity** parameter.

If operation is started while the jog move is in progress, the operation is executed as soon as the jog move stops. The settling wait function is not performed at the end of the jog move.

[Related parameter]

#10 Jog velocity

5 Functions

5.2.2 Test Operation

This operation generates a 2.5Hz square wave and uses it as position command signal for adjustment of the control part. Set the analog monitor to **test operation response** to measure the response waveform on the oscilloscope.

The position feed forward, velocity feed forward, and acceleration feed forward are set to 0 internally during the test operation.

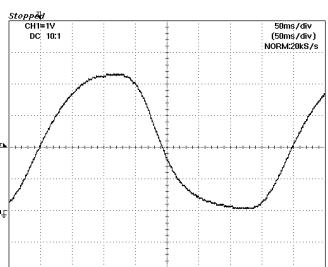
The settling wait function is not performed at the end of the test operation.

[Related parameters]

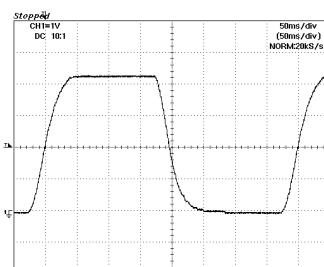
- #31 Operation width under testing mode
- #50 Position control bandwidth 1
- #48 Position control bandwidth 2
- #51 Velocity control bandwidth 1
- #49 Velocity control bandwidth 2
- #53 Position integral limiting value
- #70 Analog monitor selection
- #72 Test operation monitoring gain (analog monitor)

⚠ Caution

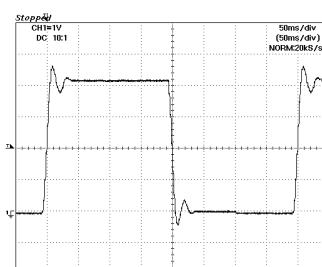
- Obtain the fastest possible rise time of the response waveform and make adjustments so that overshoot will not occur.
- The closer the position control bandwidth and velocity control bandwidth are, the more the waveform will oscillate.
- If the inertia and weight of the load are large, the oscillations may be eliminated by setting the position integral limiting value to a small value.



Increase the position control bandwidth.



Make adjustments until this waveform is reached



If the velocity control bandwidth cannot be increased any further, the position control bandwidth should be decreased

5.2.3 Auto-Tuning Operation

This operation makes the rotor oscillate, measures the inertia and weight of the load, and automatically sets the parameters for the control part.

It accelerates/decelerates with half the rated torque and rated thrust of the motor, and measures the inertia and weight of the load from the velocity changes at that time. The result of the measurement is written to the #155 **Load inertia/load mass** parameter.

From the measured inertia and weight of the load, it adjusts the position control bandwidth, velocity control bandwidth, and position integral limiting value according to the setting value of the #38 **Servo stiffness settings** parameter. For the position control bandwidth and the velocity control bandwidth, the results are reflected in the parameters on the side selected by the controller interface (see Section 6.5.2, “Position Control Bandwidth Selection FN” and Section 6.5.3, “Velocity Control Bandwidth Selection GAIN”). It does not adjust position feed forward, velocity feed forward, and acceleration feed forward.

The settling wait function is not performed at the end of the auto-tuning operation.

[Related parameters]

- #32 Operation width under Auto-tuning
- #33 Maximum deceleration under Auto-tuning
- #34 Initializing the deceleration time while under Auto-tuning
- #37 Auto-tuning repeat count
- #38 Servo stiffness settings

[Auto-set parameters]

- #50 Position control bandwidth 1
- #48 Position control bandwidth 2
- #51 Velocity control bandwidth 1
- #49 Velocity control bandwidth 2
- #53 Position integral limiting value
- #155 Load inertia/load mass

5.2.4 Homing Move

In this operation the rotor is moved according to a preset home position search method in order to establish a coordinate system. After first moving to the home position determined by the proximity signal and motor Zero signal, it continues to move an amount further given in the **#29 Offset distance from the Home position** parameter's setting value. It then sets the drive coordinate command value to the value set in the **#30 Homing complete operation command value** parameter.

There are two ways to generate motor Zero signals (hardware and software Zero signals). The method used varies depending on the motor. See the explanation given below.

The homing operation is processed in the following order.

The move can only be trapezoidal but it is possible to set the acceleration and deceleration profile. In addition, the velocity override does function in real time.

The settling wait function is performed at each point during the homing operation.

[Related parameters]	[Hardware Zero signal] Applicable motor: DYNASERV DMA and DMB series	[Software Zero signal] Applicable motor: DYNASERV Flat motor (DM1004B) Small-diameter motor (DM1004C) Standard DRA, DRB and DRE series High-speed DRB and DRE series
#11 Over-travel search velocity during a homing move #12 Homing operation: Home sensor proximity signal search velocity #13 Homing operation: Home sensing feed velocity 1 #15 Homing operation: Origin position offset feed velocity #20 Homing direction #21 Enable/Disable the over-travel signal under the homing mode #25 Homing operation: Origin inside selection #26 Enabling the proximity signal during OT search under the homing mode #27 Enabling the homing flag position error #29 Offset distance from the Home position #30 Homing complete operation command value #202 Coordinates (+) direction setting		

(1) OT search move

The rotor moves until it finds an over-travel (OT) signal in the opposite side of the homing direction and in the opposite direction of homing direction. It is executed only when the OT signal search move is enabled in **#21 Enable/Disable the over-travel signal under the homing mode** parameter.

If the proximity signal during OT search move is enabled in the **#26 Enabling the proximity signal during OT search under the homing mode** parameter, and an home position proximity signal is detected during an OT search move, the rotor stops the OT search move, and then proceeds to (2) or (3) below.

The moving velocity is set to the value in **#11 Over-travel search velocity during a homing move** parameter.

(2) Homing search move

The rotor moves until it finds a homing sensor in the homing direction.

The moving velocity is set to the value in **#12 Homing operation: Home sensor proximity signal search velocity** parameter.

(3) Moving to outside of home position proximity area

This is executed only if #25 = 1. If #202 = 1, the rotor moves in (+) direction until it leaves the home position proximity area. If #202 = 0, the rotor moves in (-) direction until it leaves the home position proximity area. The moving velocity is set to the value in the **#13 Homing operation: Home sensing feed velocity 1** parameter.

5 Functions

(4) First home sensing move

With the **#25 Homing operation: Origin inside selection** parameter, it is possible to select and set either the inside Zero signal or outside Zero signal of the home position proximity signal as the home position. If #25 = 1, the inside Zero signal is set as the home position; if #25 = 0, the outside Zero signal is set as the home position. If #202 = 1, the rotor moves to search the home position proximity signal in (-) direction. If #25 = 1, the rotor recognizes the first Zero signal edge as the home position upon entering the area, and then stops. If #25 = 0, the rotor recognizes the first Zero signal edge as the home position upon leaving the area, and then stops. If #202 = 0, the rotor moves to search the home position proximity signal in (+) direction. If #25 = 1, the rotor recognizes the first Zero signal edge as the home position upon entering the area, and then stops. If #25 = 0, the rotor recognizes the first Zero signal edge as the home position upon leaving the area, and then stops. The moving velocity is set to the value in the **#13 Homing operation: Home sensing feed velocity 1** parameter.

(5) Second home sensing move

The second home sensing move is executed in two steps.

1) Preparation move

The rotor moves as far as diametrically opposite the Zero signal edge in the opposite direction of the Zero signal edge search direction that was used in the first home sensing move.

The moving velocity is set to the value in the **#13 Homing operation: Home sensing feed velocity 1** parameter.

2) Zero signal edge search move

The rotor moves until it finds the Zero signal edge in the Zero signal edge search direction that was used in the first home sensing move.

The moving velocity is set to the value in the **#13 Homing operation: Home sensing feed velocity 1** parameter.

(6) Home position move

The home position is moved to the detected Zero signal edge position. Motors that use software Zero signals further perform a second corrective move.

The moving velocity is determined internally by the driver.

(7) Home position offset move

The home position is moved for the distance given by the value set in **#29 Offset distance from the Home position** parameter, after which the operation coordination command value is set to the value given in **#30 Homing complete operation command value** parameter.

The moving velocity is set to the value in **#15 Homing operation: Origin position offset feed velocity** parameter.

For the homing move to be completed normally, the distance between the home position proximity area and the Zero signal edge must be within a specific range based on the value of **#358 Z-phase signal pulse interval** monitor. The reference value differs depending on the method by which the Zero signal (hardware or software Zero signal) is generated.

At the first home sensing move, the distance to the first Zero signal edge after passing through the home position proximity area (pulse amount) has been measured and written in **#318 Homing operation: The measured value** monitor. If this value does not satisfy the equations below, an error or warning will occur. In that case, the home position proximity dog should be adjusted and the homing move should be performed again. Repeat these steps until the operation is completed normally.

[Hardware zero signal type]

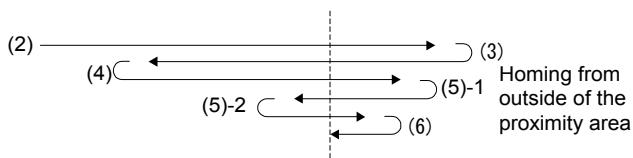
0.05* #358 value	\leq	#318 value	$<$	0.05* #358 value	error
0.1 * #358 value	\leq	#318 value	\leq	0.1 * #358 value	warning
0.7 * #358 value	$<$	#318 value	\leq	0.7 * #358 value	normal
0.75* #358 value	$<$	#318 value	\leq	0.75* #358 value	warning
					error

[Software zero signal type]

0.05* #358 value	\leq	#318 value	$<$	0.05* #358 value	error
0.1 * #358 value	\leq	#318 value	\leq	0.1 * #358 value	warning
0.4 * #358 value	$<$	#318 value	\leq	0.4 * #358 value	normal
0.45* #358 value	$<$	#318 value	\leq	0.45* #358 value	warning
					error

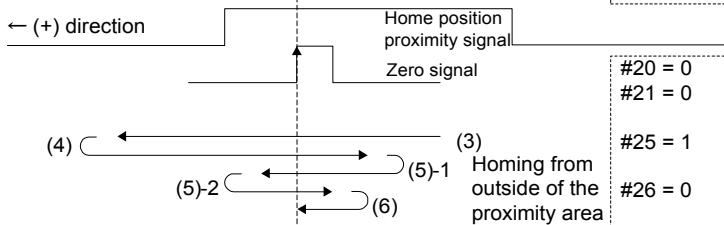
5 Functions

- Operation example 1 -



#20 = 0	Homing direction	(-) direction
#21 = 0	Enable/disable the over-travel signal under the homing mode	Not used
#25 = 1	Homing operation: Origin inside selection	Inside
#26 = 0	Enabling the proximity signal during OT search under the homing mode	Invalid
#29 = 0	Offset distance from the Home position	0
#202 = 1	Coordinate (+) direction setting	

(Initial value setting)

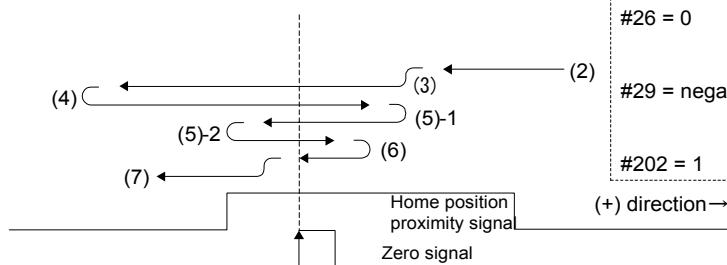


- Operation example 2 -



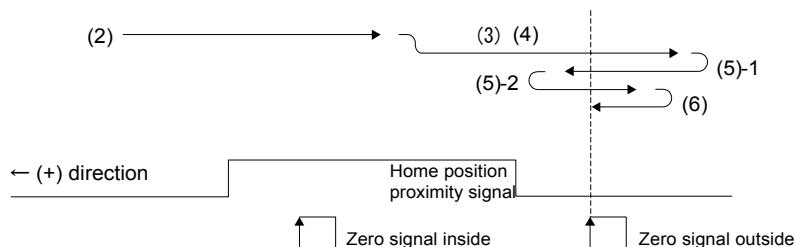
#20 = 0	Homing direction	(+) direction
#21 = 0	Enable/disable the over-travel signal under the homing mode	Used
#25 = 1	Homing operation: Origin inside selection	Inside
#26 = 0	Enabling the proximity signal during OT search under the homing mode	Invalid
#29 = positive value	Offset distance from the Home position	
#202 = 1	Coordinate (+) direction setting	

- Operation example 3 -



#20 = 0	Homing direction	(-) direction
#21 = 0	Enable/disable the over-travel signal under the homing mode	Not used
#25 = 1	Homing operation: Origin inside selection	Inside
#26 = 0	Enabling the proximity signal during OT search under the homing mode	Invalid
#29 = negative value	Offset distance from the Home position	
#202 = 1	Coordinate (+) direction setting	

- Operation example 4 -



#20 = 0	Homing direction	(-) direction
#21 = 0	Enable/disable the over-travel signal under the homing mode	Not used
#25 = 0	Homing operation: Origin inside selection	Outside
#26 = 0	Enabling the proximity signal during OT search under the homing mode	Invalid
#29 = 0	Offset distance from the Home position	0
#202 = 1	Coordinate (+) direction setting	

5.2.5 Mechanical Setting Mode

This is a special mode for changing parameters related to the mechanical settings. Parameters #200 to #299 can be changed only when this operation is being executed. In addition, once started, this operation cannot be stopped. After you finish changing the necessary parameters, turn the power to the driver off and on again. Note that if you change these parameters, the changed values are not reflected until after the power is turned on again. Therefore, please note that if you try to read a parameter value after you change the parameter, the value before the change is read until you turn the power off and on again.

5.3 Coordinate System

5.3.1 Coordinate System

The driver controls the position of the motor by three coordinate systems with different units: a *command unit coordinate system*, and a *pulse coordinate system*.

The pulse coordinate system manages the coordinate values in units of pulses that can be detected by the encoder resolver. The position control part of the driver controls the motor based on these coordinate values. It has a command value and a current value, and they are always updated and displayed in the **#320 Pulse position command value** monitor and **#321 Pulse position current value** monitor, respectively.

The command unit coordinate system manages coordinate values in the amount of pulses on the controller interface. The position command values that occur in the driver itself (test operation, auto-tuning operation, homing operation, jog move operation) are also processed based on these coordinate values. The command unit coordinate system has command values and current values, each of which are constantly updated and displayed in the **#323 Command unit command value** monitor and the **#370 Command unit current value** monitor, respectively.

5.3.2 Switching Position Command Pulse Weights

The position command value instructed from the controller interface is given to the driver by any pair of the (PLS, SIGN), (UP, DOWN) and (A, B) signals, which is then reflected in the command unit command value. Normally, the pulse position command value inside the driver for a single pulse on the controller interface becomes the value set with the **#207 Simplified scaling weighted data** parameter. For example, if the setting value is 4, a single pulse on the controller interface will be equivalent to 4 pulses inside the driver.

In addition, the command unit current value is output from the driver by either the (UP, DOWN) or (A, B) signal. The pulse position current value inside the driver for a single pulse on the controller interface always becomes the value set with the **#207 Simplified scaling weighted data** parameter. For example, if the setting value is 4, a single pulse on the controller interface will be equivalent to 4 pulses inside the driver.

While the input signal “PLS_DIRECT” is on, the position command value instructed from the controller interface is independent of the value set with the **#207 Simplified scaling weighted data** parameter; a single pulse on the controller interface will be a single pulse inside the driver, instead. However, do not change the status of any of the (PLS, SIGN), (UP, DOWN) and (A, B) signals for 2 msec each before and after switching the input signal “PLS_DIRECT” (off → on, on → off).

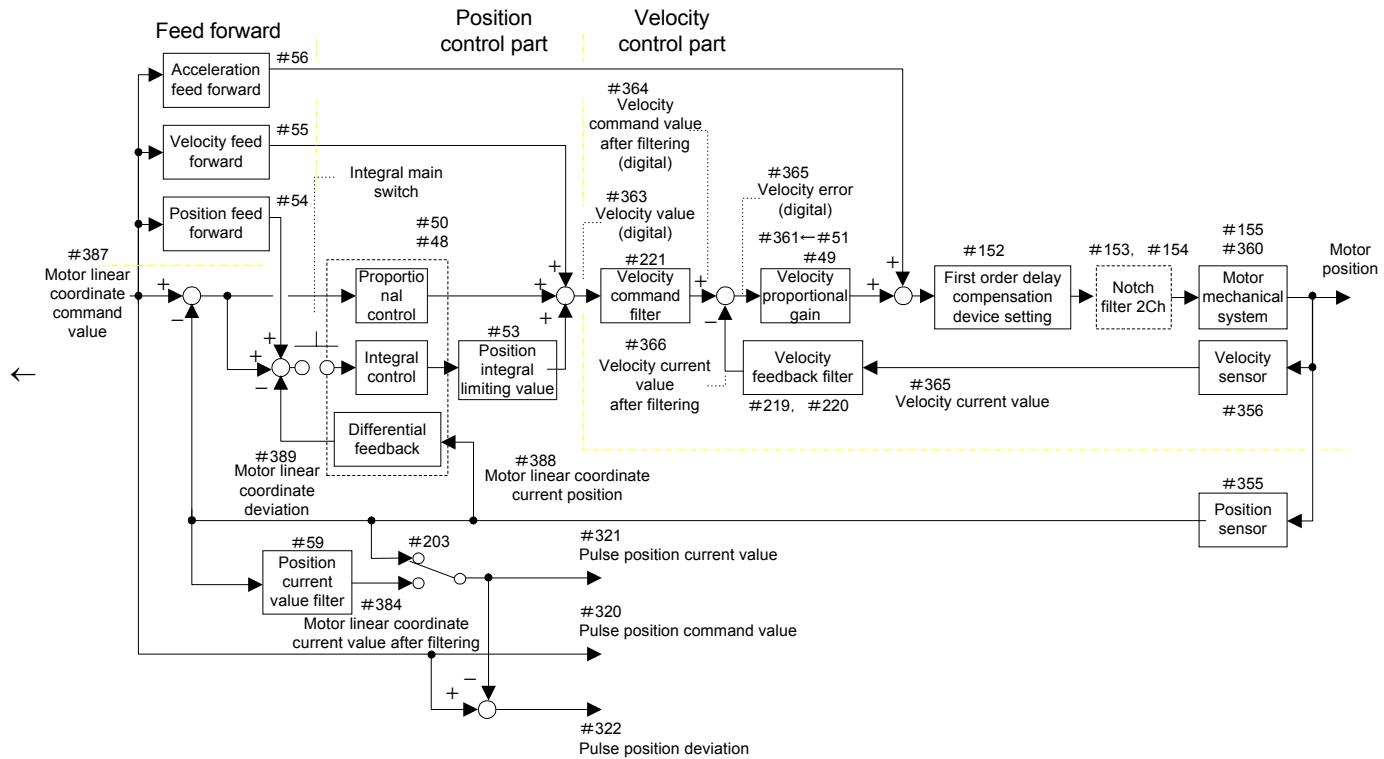
[Related parameters]

#207 Simplified scaling weighted data

5 Functions

5.4 Control System

In this section, the *position control part*, *velocity control part*, and *feed forward* of the driver are explained. The block diagram of the control system is shown below.



5.4.1 Velocity Control Part

For the velocity control bandwidth, either the value set with the #51 *Velocity control bandwidth 1* parameter or the #49 *Velocity control bandwidth 2* parameter is selected, according to the status of the controller interface input signal IN_GAIN. The selected value is displayed in the #376 *Velocity control bandwidth* monitor. The velocity control part calculates the #361 *Velocity proportional gain* monitor value from the #155 *Load inertia/load mass* parameter value, which is either measured and set by an auto-tuning operation or entered directly as a numerical value, according to the velocity control bandwidth value. During this process, the frequency characteristics of neither the velocity feedback filter nor the notch filter are considered but only the frequency characteristic of the first order delay compensation device is considered to calculate the velocity proportional gain.

The first order compensation device can be set in four ways via the #152 *First order delay compensation device setting* parameter. The first order delay compensation device has the effect that it improves the gain characteristics of the velocity control part. The frequency characteristics for each setting of the first order compensation device is shown below. Note that there is no frequency dependency when the first order compensation is not set.

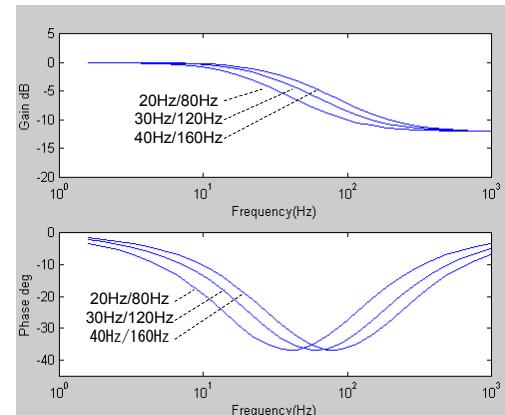
There are two channels available for the notch filter (optional). The central frequency value can be set independently for each channel via the #153 *Notch filter: Frequency selection 1* and #154 *Notch filter: Frequency selection 2* parameters. The notch filter has the effect that it improves the gain characteristics of mechanical systems that tend to resonate.

The velocity feedback filter can be enabled or disabled by setting the #219 *Enable/Disable velocity feedback filter* parameter. When enabled, the filter bandwidth can be set in the #220 *Velocity feedback filter bandwidth* parameter. The velocity feedback filter is effective in eliminating noise at motor operation, but with a small bandwidth the velocity control part tends to oscillate.

The filter bandwidth of the velocity command filter can be set in the #221 *Velocity command filter bandwidth* parameter. The velocity command filter helps achieving smoother acceleration/deceleration, but with a small bandwidth the position control part tends to oscillate.

[Related parameters]

- #51 Velocity control bandwidth
- #152 First order delay compensation device setting
- #153 Notch filter: Frequency selection 1
- #154 Notch filter: Frequency selection 2
- #155 Load inertia/load mass
- #219 Enable/Disable velocity feedback filter
- #220 Velocity feedback filter bandwidth
- #221 Velocity command filter bandwidth



[Frequency characteristics of the first order delay compensation device]

5 Functions

5.4.2 Position Control Part

For the position control bandwidth, either the value set with the #50 *Position control bandwidth 1* parameter or the #48 *Position control bandwidth 2* parameter is selected, according to the status of the controller interface input signal IN_FN. The selected value is displayed in the #375 *Position control bandwidth* monitor.

The position control part calculates the proportional control gain, integral control gain, and differential feedback gain, according to the position control bandwidth value.

The position integral limiter set by the #53 *Position integral limiting value* parameter is effective in suppressing integrator windup due to motor torque and thrust saturation. Decrease the value in order to suppress windup further. On the other hand, if you set the value too small, the motor torque and thrust are limited; set a value as large as possible in the range where windup does not occur.

The integral operation of the position control part can also be set either to be active (allow) or inactive (prohibit). If you clamp the motor with an external device when the motor is stopped, the integral operation should be prohibited after clamping in order to prevent overloading the controller. Refer to Chapter 6 “Controller Interface” and Chapter 7 “RS232C Interface” for details of the operation.

The position current value filter outputs the result obtained by filtering the position current value to the #384 *Motor linear coordinate current value after filtering* monitor. The filter bandwidth is set with the #59 *Position current value filter frequency* parameter. The position control part outputs a value before or after being filtered to the #321 *Pulse position current value* monitor, according to the setting status of the #203 *Using position current value filter* parameter. It also calculates the value of the #322 *Pulse position deviation* monitor, using the current value before or after being filtered, according to the setting status of the #203 parameter.

[Related parameters]

- #50 Position control bandwidth 1
- #48 Position control bandwidth 2
- #53 Position integral limiting value
- #59 Position deviation filter frequency
- #203 Using position current value filter

5.4.3 Feed Forward

Three types of feed forward functions are available: position feed forward, velocity feed forward, and acceleration feed forward. Feed forward function is effective for quick positioning.

The position feed forward can be set by percentage in the #54 *Position feed forward percentage* parameter.

The position feed forward makes the position deviation at equal velocity move smaller and helps to achieve a smooth settling at acceleration/deceleration.

The velocity feed forward can be set by percentage in the #55 *Velocity feed forward percentage* parameter.

The acceleration feed forward calculates the acceleration feed forward gain from the #155 *Load inertia/load mass* parameter values, which are measured and set by the auto-tuning operation or set directly by numerical values, based on the #56 *Acceleration feed forward gain* parameter. #56 parameter is given as a percentage.

[Related parameters]

- #54 Position feed forward percentage
- #55 Velocity feed forward percentage
- #56 Acceleration feed forward percentage
- #155 Load inertia/load mass

5.4.4 Servo Stiffness Parameter

The #38 *Servo stiffness settings* parameter is for general settings for the control system. The control parameters are set based on this parameter after measuring the load inertia/load mass in the auto-tuning operation.

If #38 is changed, either one of the position control bandwidth parameters (#50, #48) selected by IN_FN and either one of the velocity control bandwidth parameters (#51, #49) selected by IN_GAIN are set. In addition, the gain of the control system is set automatically, and the position integral limiting value parameter (#53) is also automatically set to the minimum position integral limiting value that can generate the maximum torque and the maximum thrust in the motor lock status. It is not necessary to set parameters related to feed forward and filters again.

[Related parameters]

#38	Servo stiffness settings
#50	Position control bandwidth 1
#48	Position control bandwidth 2
#51	Velocity control bandwidth 1
#49	Velocity control bandwidth 2
#53	Position integral limiting value

5 Functions

5.5 Acceleration/Deceleration Function

This driver performs trapezoidal moves during jog moves and homing moves, and uses the acceleration/deceleration function described in this section.

In addition, it has a velocity override function for switching velocity during a move, which works in real time even during the move (*real time velocity override function*).

The maximum velocity of the motor is defined in #213 *Maximum velocity*, but is limited by the maximum velocity defined within the driver. The limited value is displayed in the #357 *Maximum velocity* monitor.

5.5.1 Velocity Override Function

The velocity override value is set with the #16 *Velocity override percentage 1* parameter.

The velocity override value can be set in increments of 0.01% from 0 to 200%. Please note that if a value greater than 100% is set, the velocity during the move may exceed the maximum velocity, which may cause an error. How the velocity override is applied differs for the trapezoidal move and cam profile move.

[Related parameters]

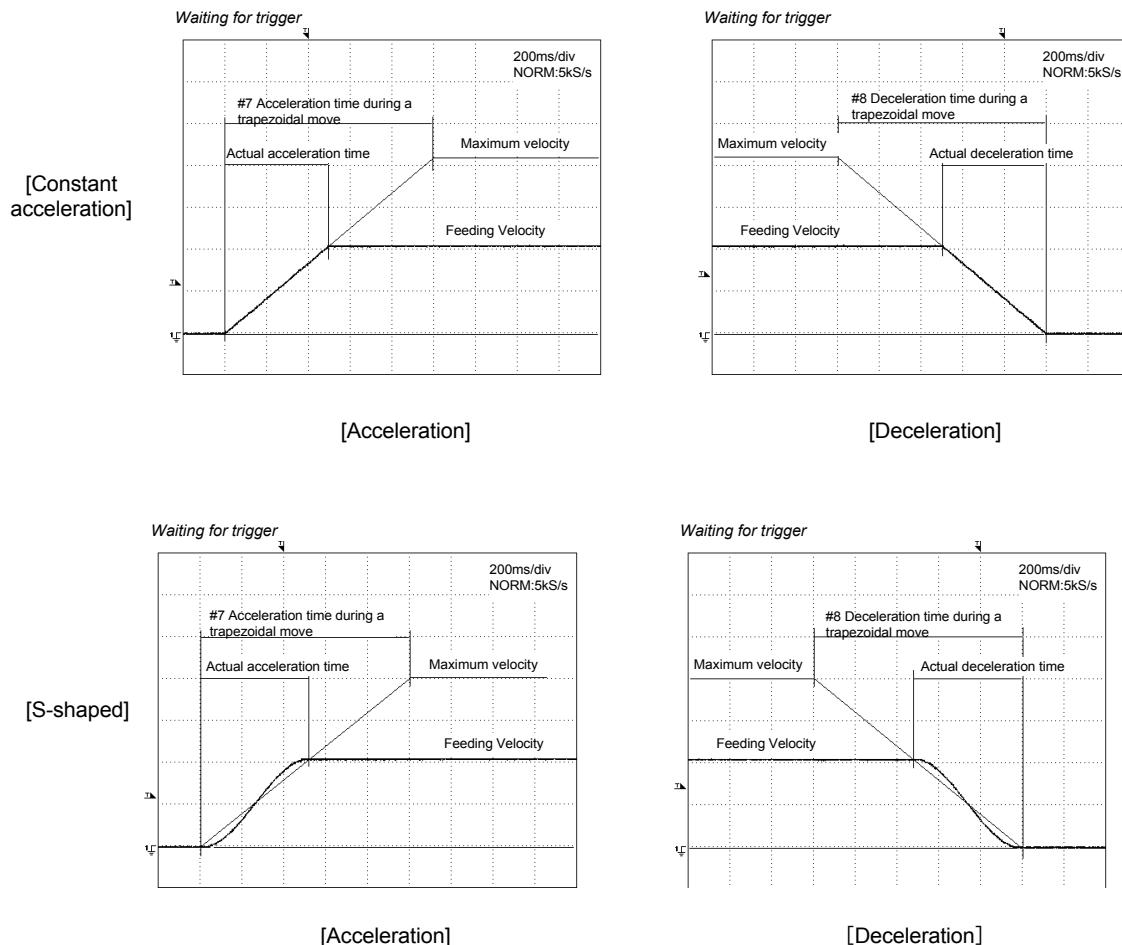
#16 Velocity override percentage 1

5.5.2 Velocity Profile

In a trapezoidal motion, the acceleration of the moving part follows the acceleration type set by the #4 *Selecting acceleration type* parameter until it reaches the feed velocity. Hereafter, the move is continued with the feed velocity, then decelerates and stops according to the deceleration type set by the #5 *Selecting deceleration type* parameter. The feed velocity varies depending on the operation.

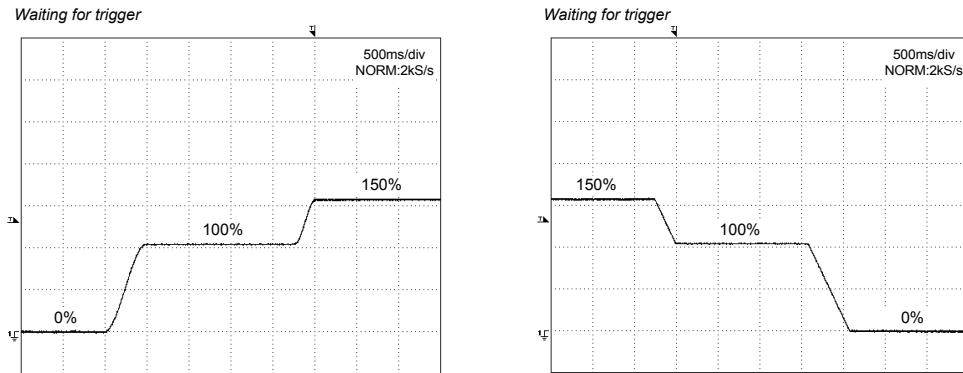
The acceleration and deceleration types can be selected separately. There are two options for acceleration and deceleration: a *constant acceleration type* and an *S-shaped type* (where the acceleration/deceleration follows a second order spline). Generally, the S-shaped type can limit vibrations in the machine better, but the peak torque or peak thrust at acceleration/deceleration become greater and a correspondingly larger motor torque or motor thrust will be required.

The acceleration/deceleration time can also be selected separately. The values of the #7 *Acceleration time during a trapezoidal move* and #8 *Deceleration time during a trapezoidal move* parameters are set to values equivalent to the maximum velocity shown in the #357 *Maximum velocity* monitor. The actual acceleration/deceleration time becomes the value obtained by multiplying the maximum velocity by the velocity ratio during a trapezoidal move. By doing so, the same acceleration can be maintained without changing #7 and #8 even when the feed velocity setting is changed.



5 Functions

The feed velocity during a move becomes the commanded velocity multiplied by the velocity override value. If the velocity override value is changed during a move, the moving part is accelerated at the same acceleration profile and acceleration as the normal acceleration time when the velocity override value is increased. In the same way, the moving part is decelerated at the same deceleration profile and deceleration as the normal deceleration time when the velocity override value is decreased.



[Acceleration: s-shaped, deceleration: constant acceleration]

[Related parameters]

- #3 Selecting the type of cam profile move
- #4 Selecting the acceleration type
- #5 Selecting the deceleration type
- #7 Acceleration time during a trapezoidal move
- #8 Deceleration time during a trapezoidal move

5.6 Other Functions

5.6.1 Settling Wait, Position Settling Status, and Positioning Status

Position settling status refers to the status where the position deviation (pulse coordinates) is within the specified range in the pulse coordinate system. The specified range is set with the #58 *Position settling pulse width 1*, #45 *Position settling pulse width 2*, #46 *Position settling pulse width 3*, and #47 *Position settling pulse width 4* parameters in pulse units, which are selected by the controller interface input signal IN_POSW[1..0]. The selected value is then displayed in the #377 *Position settling width* monitor. The #322 *Pulse position deviation* monitor is used for the position deviation to be evaluated. The position settling status is set when the absolute value of position deviation becomes shorter than the position settling width for the duration set with the #61 *Position settling signal chattering processing count* parameter. The check cycle is 2 msec. If chattering occurs in a “COIN” due to an overshoot during position settling, depending on the load status, the settling condition can be obtained without fail by increasing the chattering processing count. The position settling status is displayed in the #328 *Position settling status* monitor. It is also displayed with the “COIN” LED on the front panel: it turns on to indicate the position settling status. Furthermore, it is output to the “COIN” of the CN3 analog monitor interface by a digital signal.

Positioning status is the status where an acceleration/deceleration command for a move is completed and in position settling status. The positioning settling status is displayed in the #329 *Positioning status* monitor.

Settling wait is a function invoked to keep on waiting until the positioning status is reached at the end of a move. Settling wait can be made in two ways depending on the operation: never perform settling wait or always perform settling wait.

Operation	
Never perform	Jog move, test operation, auto-tuning operation
Always perform	Homing move

[Related parameters]

- #58 Positioning settling width 1
- #45 Positioning settling width 2
- #46 Positioning settling width 3
- #47 Positioning settling width 4
- #61 Position setting signal chattering processing count
- #203 Using position current value filter

5 Functions

5.6.2 Velocity Monitor and Analog Monitor

The current velocity value of the motor is output to “VEL” of the CN3 analog monitor interface as the *velocity monitor* signal.

The signal sensitivity of the velocity monitor ([V/rps] in case of a rotating DYNASERV motor and [V/mps] in case of a linear LINEARSERV motor) can be obtained by multiplying the #69 *Velocity monitor gain* parameter setting by the #356 *Digital velocity sensitivity* monitor value. For example, if the setting of #69 is 6.55V/8192 digits and the value of #356 is 4800 [digit/rps] in a rotating motor, the signal sensitivity of the velocity monitor is 3.84 [V/rps]. The velocity monitor signal is output in the range of $\pm 6.55V$.

Moreover, it is possible to output only the AC element of the current velocity value of the motor via the setting of the #75 *Velocity monitor selection* parameter.

One of the data items below is output to “AMON” of the CN3 analog monitor interface as an *analog monitor* signal.

The content of the analog monitor can be selected by the #70 *Analog monitor selection* parameter. Depending on the selected content, the signal sensitivity is adjusted using the corresponding monitor gains #71 to 74. The analog monitor signals are output in the range of $\pm 6.55V$.

Analog monitor selection	Unit	Monitor gain
Position deviation	Pulse	#71 Positioning error monitoring gain (Analog monitor)
Test operation response	Pulse	#72 Test operation monitoring gain (Analog monitor)
Position command value	Pulse	#73 Position monitoring gain (Analog monitor)
Position current value	Pulse	#74 Position differential value monitor gain (Analog monitor)
Position command differential value	pps	
Position current differential value	pps	

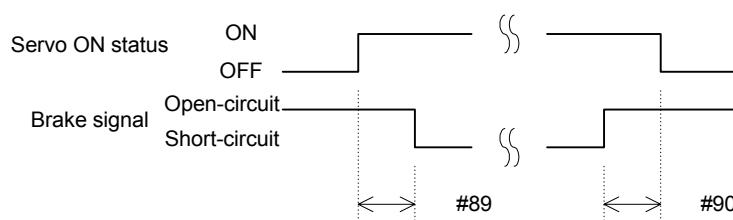
[Related parameters]

- #69 Velocity monitoring gain
- #70 Analog monitor selection
- #71 Positioning error monitoring gain (Analog monitor)
- #72 Test operation monitoring gain (Analog monitor)
- #73 Position monitoring gain (Analog monitor)
- #74 Position difference value monitor gain (Analog monitor) #74
- #75 Velocity monitor selection

5.6.3 Brake Signal

BRK+ and BRK- are output to the TB2 external sensor interface as brake signal outputs that operate linked to the Servo ON status. The brake signal is a relay contact output. The contact opens when the brake should be applied such as when the power is disconnected or the driver is in Servo OFF status, and the contact short circuits when the brake should be released.

The Servo ON status and the brake signal operate according to the timing diagram shown below via the #89 *Brake turn OFF delay time upon Servo ON* and #90 *Advanced brake turn ON before Servo OFF* parameters.



[Related parameters]

- #89 Brake turn OFF delay time upon Servo ON
- #90 Advanced Brake turn ON before Servo OFF

5.7 Special Parameter Processing

The setting values of the parameters listed below are automatically changed inside the driver by the operation of the driver.

5.7.1 Internal Generation of Parameter Initial Values

The initial values of all of the following parameters when they are reset will be generated internally by the motor:

[Related parameters]

#9	Feeding velocity	Value obtained by converting the motor rating velocity into command units.
#10	Jog velocity	Value obtained by converting the motor rating velocity into command units.
#11	Over-travel search velocity during a homing move	Value obtained by converting the motor rating velocity*0.1 into command units.
#12	Homing operation: Home sensor proximity signal search velocity	Value obtained by converting the motor rating velocity*0.1 into command units.
#13	Homing operation: Home sensing feed velocity 1	Value obtained by converting the motor rating velocity*0.05 into command units.
#15	Homing operation: Origin position offset move feed velocity	Value obtained by converting the motor rating velocity*0.1 into command units.
#31	Operation width under testing mode	Value obtained by converting the motor rating velocity*0.002 into command units.
#32	Operation width under Auto-tuning	Value obtained by converting the motor rating velocity*0.02 into command units.
#213	Maximum velocity	Value obtained by converting the motor rating velocity into command units.
#207	Simplified scaling weighted data	DM: 4 DR: 2 1: Pulse width equivalent to command unit * 1 2: Pulse width equivalent to command unit * 5 3: Pulse width equivalent to command unit * 20 4: Pulse width equivalent to command unit * 100
#58	Positioning setting width	

5.7.2 Limiting and Checking Maximum Velocity When Changing Simplified Scaling Weighted Data and Maximum Velocity Parameters

The following maximum velocity limiting and checking are performed during processing when the power is turned ON after simplified scaling weighted data is changed.

- Limit item 1) A limit is set when the maximum velocity in command units [unit/s] exceeds 9999999.
- 2) A data checksum error is generated when the maximum velocity in pulse units [pls/s] exceeds 8000000.

5 Functions

5.7.3 Auto Conversion and Clear Functions When Changing Simplified Scaling Weighted Data

When simplified scaling weighted data is changed, the following parameters are automatically converted:

[Related parameters]

- #9 Feeding velocity
- #10 Jog velocity
- #11 Over-travel search velocity during a homing move
- #12 Homing operation: Home sensor proximity signal search velocity
- #13 Homing operation: Home sensing feed velocity 1
- #15 Homing operation: Origin position offset move feed velocity
- #29 Offset distance from the Home position
- #31 Operation width under testing mode
- #32 Operation width under Auto-tuning
- #58 Positioning setting width
- #45 Positioning setting width2
- #46 Positioning setting width3
- #47 Positioning setting width4
- #213 Maximum velocity

5.7.4 Limiting the Maximum Parameter Values

Limit processing is performed for the following parameters related to velocity at the time of parameter entry and when the power is turned ON.

[Related parameters]

- #9 Feeding velocity
- #10 Jog velocity
- #11 Over-travel search velocity during a homing move
- #12 Homing operation: Home sensor proximity signal search velocity
- #13 Homing operation: Home sensing feed velocity1
- #15 Homing operation: Origin position offset move feed velocity

[At the time of parameter entry]

If a parameter value exceeds #357 *Maximum velocity monitor value* when it is set by the user, it will be processed as out of range data. However, limit processing is not performed in the hold-on state (while downloading parameters), when changing the simplified scaling weighted data, or when changing the maximum velocity data.

[When the power is turned ON]

During processing when the power is turned ON after simplified scaling weighted data or maximum velocity data is changed, a limit is applied using the value equivalent to the #357 *Maximum velocity* monitor that is successively initialized.

Chapter 6

Control Interfaces

6.1 Terminal Function

- 6.1.1 Connection, Setting, and I/O Mapping
- 6.1.2 Explanation of Terminals
- 6.1.3 Electrical specifications
- 6.1.4 I/O logic setting

6.2 Position Command Pulse Input

6.3 Encoder Pulse Output

6.4 Operations

- 6.4.1 Starting an Operation
- 6.4.2 Aborting an Operation
- 6.4.3 Timing Charts

6.5 Other Inputs

- 6.5.1 Pulse Weight Selection PLS_DIRECT
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- 6.5.5 Disable Position Control Integral Operation PACT
- 6.5.6 Error reset (ERR_RESET)
- 6.5.7 Servo ON SERVO
- 6.5.8 Current Limit Input

6 Control Interfaces

6.1 Terminal Function

6.1.1 Connection, Setting, and I/O Mapping

CN4

Made by Honda Tsushin Kogyo

Connector PCR-S36FS

Cover PCR-LS36LA

19	IN_ERR_RESET	01	COMP1
20	IN_SERVO	02	COMN1
21	IN_MODE_START	03	OUT_DRDY
22	IN_ABORT	04	OUT_SRDY
23	IN_MODE_0	05	OUT_BUSY
24	IN_MODE_1	06	OUT_XOVL
25	IN_POSW_0	07	OUT_OVER
26	IN_POSW_1	08	OUT_COIN
27	IN_GAIN	09	UA_OUT+
28	IN_FN	10	UA_OUT-
29	IN_PLS_DIRECT	11	DB_OUT+
30	IN_PACT	12	DB_OUT-
31	(NC)	13	Z_OUT+
32	(NC)	14	Z_OUT-
33	CRNT_LMT_IN+	15	PUA_IN+
34	CRNT_LMT_IN-	16	PUA_IN-
35	(NC)	17	SDB_IN+
36	(NC)	18	SDB_IN-

Note) Do not connect any terminal with NCs.

6.1.2 Explanation of Terminals

		Signal name	Description
Contact input signals Total 12 points			
IN_MODE_START	1	Operation start command	Starts operation when setting from OFF to ON.
IN_ABORT	1	Operation abort command	Stops operation when setting from OFF to ON.
IN_MODE1, 0	2	Operation mode number	
IN_PLS_DIRECT	1	Pulse weight selection	
IN_FN	1	Position control bandwidth selection	Changes the position control bandwidth.
IN_GAIN	1	Velocity control bandwidth selection	Changes the velocity control bandwidth.
IN_POSW1, 0	2	Settling width selection	Switches the settling width.
IN_PACT	1	Position control integral operation disabled	Disables the integral operation by turning ON.
IN_ERR_RESET	1	Error reset	Executes error status reset when setting from OFF to ON.
IN_SERVO	1	Servo ON	Servo ON by turning ON.
Contact output signals Total 6 points			
OUT_DRDY	1	Driver ready	Turns ON when it is not in the error status.
OUT_SEDY	1	Servo ready	Turns ON when it is in the servo ready status.
OUT_OVER	1	Over signal	Turns ON when position deviation overflow or excessive velocity occurs.
OUT_XOVL	1	Overload signal	Turns OFF when overload occurs.
OUT_COIN	1	Position settling signal	Turns ON when the position deviation is within the settling width.
OUT_BUSY	1	Busy	The status where operation cannot be performed according to the pulse train position command.
Position command pulse input signals Total 2 pairs			
PUA_IN ±	1	Position command pulse 1	PLS, UP, or A, depending on the setting
SDB_IN ±	1	Position command pulse 2	SIGN, DOWN, or B, depending on the setting
Position current pulse output signals Total 3 pairs			
UA_OUT ±	1	Position current pulse 1	UP or A, depending on the setting
DB_OUT ±	1	Position current pulse 2	DOWN or B, depending on the setting
Z_OUT ±	1	Origin pulse	
Analog input Total 1 pair			
CRNT_LMT_IN ±	1	Current limit	0V: 0% to 10V: 100%

6 Control Interfaces

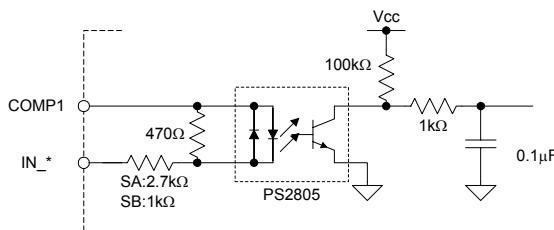
6.1.3 Electrical specifications

[Interface power supply inputs] COMP1, COMN1

Input the interface power supply for contact inputs and contact outputs.

Interface type name	SA	SB
Rated voltage	12 to 24 VDC ($\pm 10\%$)	5 VDC ($\pm 10\%$)

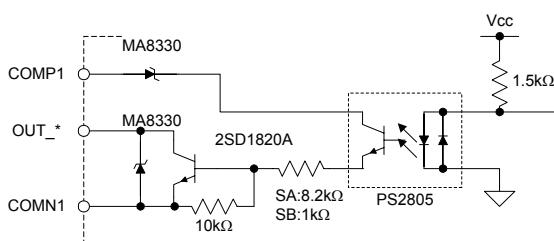
[Contact inputs] IN_ERR_RESET, IN_SERVO, IN_MODE_START, IN_ABORT, IN_MODE.0, IN_MODE.1, IN_POSW.0, IN_POSR.1, IN_GAIN, IN_FN, IN_PLS_DIRECT, IN_PACT



Input is ON while current flows into the photocoupler.

Interface type name	SA	SB
Rated voltage	12 to 24 VDC ($\pm 10\%$)	5 VDC ($\pm 10\%$)
Rated input current	4.1 mA/point (at 12 VDC) 8.5 mA/point (at 24 VDC)	4.0 mA/point (at 5 VDC)
Input impedance	3.0kΩ	1.0kΩ
Operation voltage (relative to COMP*)	At OFF 3.0VDC or less At ON 9.0VDC or more	At OFF 1.0VDC or less At ON 4.0VDC or more
Allowable leak current	OFF is guaranteed at 1.0 mA or less	

[Contact outputs] OUT_DRDY, OUT_SRDY, OUT_BUSY, OUT_XOVL, OUT_OVER, OUT_COIN

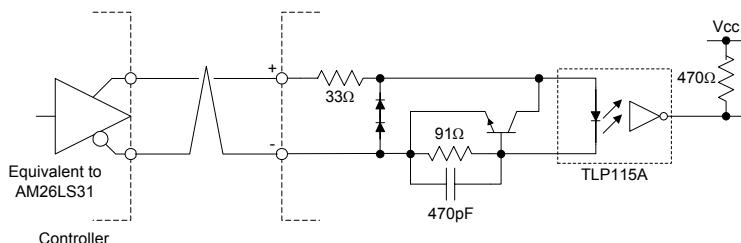


Interface type name	SA	SB
Rated voltage	12 to 24 VDC ($\pm 10\%$)	5 VDC ($\pm 10\%$)
Maximum load current	0.1A/point, 0.5 A/common	
ON voltage	0.5VDC or less	
Leak current at OFF	0.1mA or less	

Output is ON while the output transistor is ON.

[Position command pulse inputs] PUA_IN ±, SDB_IN ±

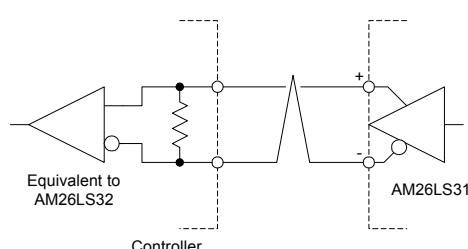
Connect a differential type line driver conforming to the RS422A standard, which is equivalent to AM26LS31.
(There is also an open collector specification. Please contact our sales department for more details.)



Input is ON when the (+) terminal has a higher voltage than the (-) terminal, and current flows into the photocoupler

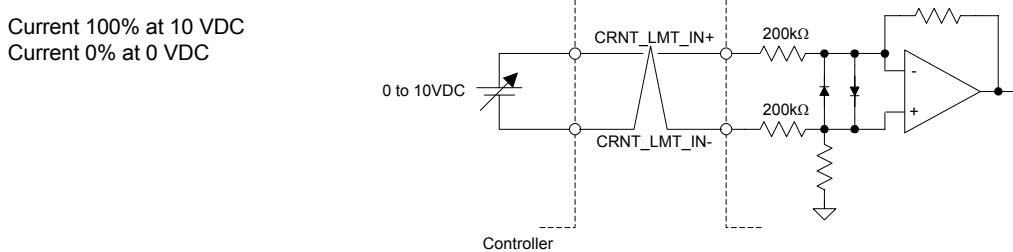
[Position current pulse outputs] UA_OUT ±, DB_OUT ±, Z_OUT ±

Connect a differential type line receiver conforming to the RS422A standard, which is equivalent to AM26LS32.



Output is ON when the (+) terminal has a higher voltage than the (-) terminal

[Current limit analog input] CRNT_LMT_IN ±



6.1.4 I/O logic setting

For the contact input and contact output signals, it is possible to set the physical I/O status and the logical relationship of the driver's internal signal status in both contact and bit units.

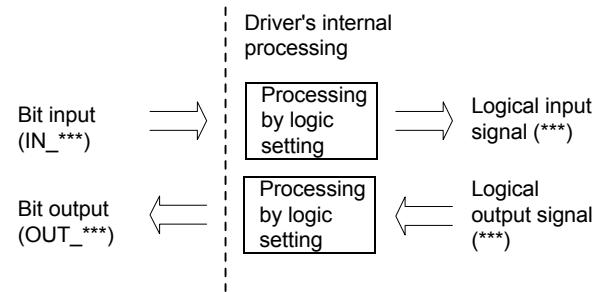
The input signals IN*** are processed via the I/O logical conversion and are then expressed as a logical input signal ***. If the signal status is reached, it is expressed as 1 and if the status is not reached, expressed as 0.

A logical output signal *** is expressed as 1 if the status is reached and 0 if the status is not reached. After conversion via the I/O logical setting, it becomes an output signal OUT_***.

The I/O logical settings at the time of shipment from the factory are set to *positive logic* for all input and output signals. In other words, the internal input and output signals are set to 1 when the corresponding contact points are turned ON. By setting the I/O logical setting for IN_SERVO to negative logic using the PC utility, it is possible to connect a PLC interface in the same state as it was shipped from the factory. As a result, an RS232C interface can be used to confirm basic operations.

Refer to Chapter 8 “DrvGII PC Utility” for a description of how to set the I/O logic.

Logic setting	Bit I/O status	Logic signal
Positive logic setting	0	Status 0
	1	Status 1
Negative logic setting	0	Status 1
	1	Status 0



6 Control Interfaces

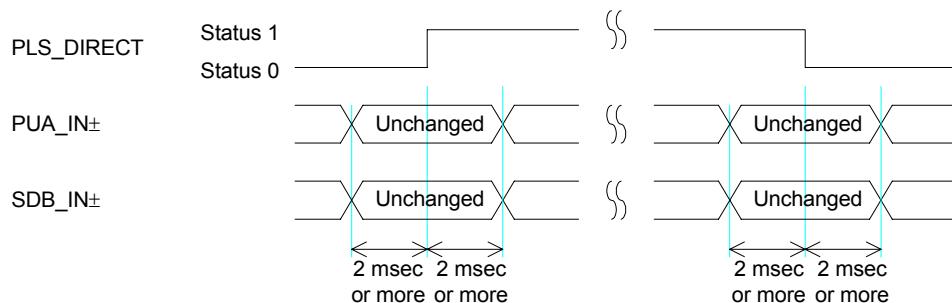
6.2 Position Command Pulse Input

The position command value instructed from the controller interface is given to the driver by any pair of the (PLS, SIGN), (UP, DOWN) and (A, B) signals, which is then reflected in the command unit command value. Which pair of the signals will be used to give a command is set with the #204 *Command pulse type* parameter.

	(PLS, SIGN)		(UP, DOWN)		(A, B)	
	+ direction	- direction	+ direction	- direction	+ direction	- direction
PUA_IN \pm	PLS	150ns min	UP	150ns min	A	
SDB_IN \pm	3μs min	3μs min	SIGN	6μs min	B	300μs min
Caution	The signal should be H when active (status for flowing current to the driver photocoupler). As for the PLS, it should be L when normal.		The signal should be H when active (status for flowing current to the driver photocoupler). As for both the UP and DOWN, they should be L when normal.		The signal should be H when active (status for flowing current to the driver photocoupler).	

The position command value instructed from the controller interface can change the weight of a single pulse on the interface by the input signal "PLS_DIRECT." When the status of the input signal "PLS_DIRECT" is 0, a single pulse on the interface becomes the value set with the #207 *Simplified scaling weighted data* parameter. While the status of the input signal "PLS_DIRECT" is 1, a single pulse on the interface is independent of the value set with the #207 *Simplified scaling weighted data* parameter, and becomes a single pulse inside the driver.

However, do not change the status of any of the (PLS, SIGN), (UP, DOWN) and (A, B) signals for 2 msec each before and after switching the input signal "PLS_DIRECT" (off → on, on → off).



6.3 Encoder Pulse Output

The position current value is output from the driver via the controller interface by either pair of the (UP, DOWN) or (A, B) signals. Which pair of the signals will be used to output is set with the #205 *Monitor pulse type* parameter.

The encoder origin signal is independent of this setting.

	(UP, DOWN)		(A, B)	
	+ direction	- direction	+ direction	- direction
UA_OUT \pm	UP 3MHz max		A	
DB_OUT \pm	DOWN		B 750kHz max	

6.4 Operations

6.4.1 Starting an Operation

The operation start command via MODE_START instructs the start of operations other than jog moves.

The operation start command is issued when the status is 1.

MODE[1..0] must set the number of the operation to be performed when the operation start command is issued via MODE_START. See the table below.

In addition, the value set by MODE[1..1] is read and processed 10ms after the operation start command is issued. Therefore, if deviation in time between outputs by the controller is within several msec, the motor can be started normally by setting the time earlier than the time of the operation start command issuance via MODE_START. However, note that the dead time for issuing the operation start command will be added to this duration (10ms). The total dead time until the motor starts operating is thus 10ms (scan time) + 10ms (read delay) + internal delay time.

The BUSY output retains the executing status even when an operation ends while MODE_START is giving a command (while in status 1) after an operation is started.

No.	Name	End type
0	Test operation	Non-self-end
1	Auto-tuning operation	Self-end
2	(Reserved)	
3	Homing move	Self-end

6.4.2 Aborting an Operation

The operation abort command via MODE_ABORT stops operations other than jog moves.

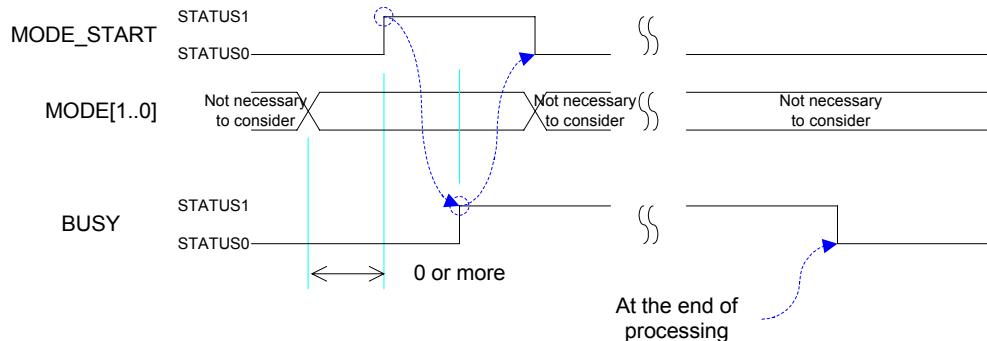
The operation abort command is issued when the status is 1.

The motor immediately decelerates even during an operation involving a move, and ends the operation.

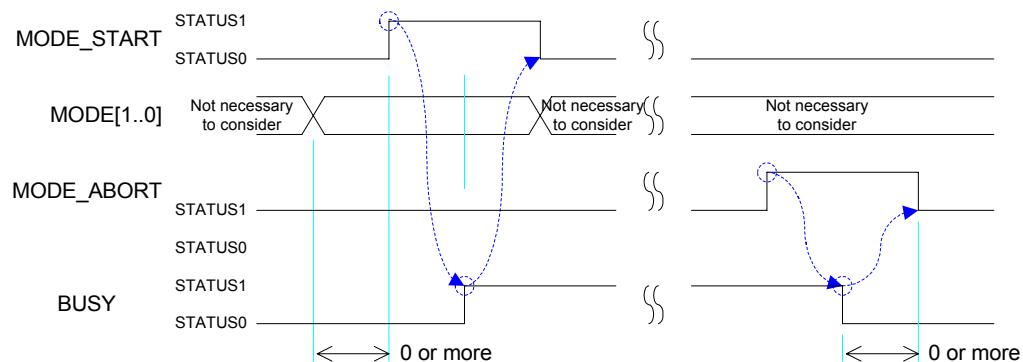
6 Control Interfaces

6.4.3 Timing Charts

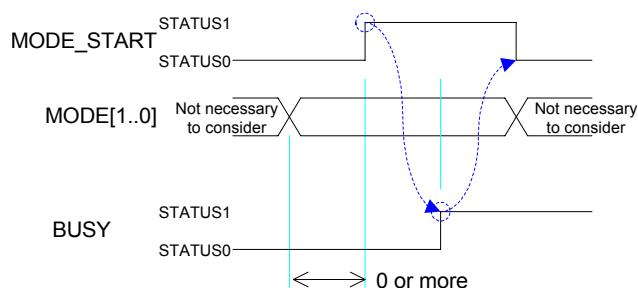
[Self-end type] In case of self-end



[Self-end type] In case of end by the operation abort command
[Non-self-end type]



[Non-end type]



6.5 Other Inputs

6.5.1 Pulse Weight Selection PLS_DIRECT

When the status of the PLS_DIRECT pulse weight selection input signal is 1, it is independent of the #207 *Simplified scaling weighted data* parameter; the position command pulse that is input is directly used as the internal position command pulse. For more details, see Section 5.3.2, “Switching Position Command Pulse Weights” and Section 6.2, “Position Command Pulse Input.”

6.5.2 Position Control Bandwidth Selection FN

The FN position control bandwidth selection signal selects to use either #50 *Position control bandwidth 1* parameter or the #48 *Position control bandwidth 2* parameter for the position control bandwidth value. Position control bandwidth 2 is selected with status 1, and position control bandwidth 1 is selected with status 0.

6.5.3 Velocity Control Bandwidth Selection GAIN

The GAIN velocity control bandwidth selection signal selects to use either #51 *Velocity control bandwidth 1* parameter or the #49 *Velocity control bandwidth 2* parameter for the velocity control bandwidth value. Velocity control bandwidth 2 is selected with status 1, and velocity control bandwidth 1 is selected with status 0.

6.5.4 Settling Width Selection POSW [1..0]

The POSW [1..0] settling width selection signal selects to use either one of #58 and #45 to #47 *Position settling width pulse 1 to 4* parameters for the settling width used as the specified range for generating settling signals.

POSW [1..0]		Settling width value
1	0	
Status 0	Status 0	#58 Position settling width pulse 1
Status 0	Status 1	#45 Position settling width pulse 2
Status 1	Status 0	#46 Position settling width pulse 3
Status 1	Status 1	#47 Position settling width pulse 4

6.5.5 Disable Position Control Integral Operation PACT

The PACT disable position control integral operation signal disables the integral operation of the position control part.

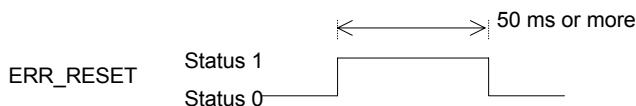
Integral operation is disabled with status 1, and integral operation is enabled with status 0.

6.5.6 Error reset (ERR_RESET)

The error reset command, ERR_RESET, cancels an error status in the driver. It functions irrespectively of the operation mode. It can only be executed while in the idle status.

The error reset command is issued as the status 1.

Depending on the error content, there are errors that cannot be canceled or errors that cause identical errors immediately after canceling. Avoid creating a program that maintains ERR_RESET and waits until ERR, the error status output, is canceled.



6 Control Interfaces

6.5.7 Servo ON SERVO

The SERVO servo ON input signal is set to servo ON when the status is 1. In addition to this instruction, the actual Servo ON/OFF status is affected by the setting of the SRV DS Servo ON disable switch on the front panel. See the table below.

Servo ON/OFF SERVO	SRV DS Servo ON disable on the front panel	Actual servo status
Status 0	Disabled	Servo OFF
	Enabled	
Status 1	Disabled	Servo ON
	Enabled	

6.5.8 Current Limit Input

The current limit analog input signal gives a current limit from 0 to 100%, in proportion to a voltage input of 0 to 10V given by the external source. To enable this function, enable the **#206 Enabling current limit external input** parameter. This parameter has been disabled by factory default setting.

Chapter 7

RS232C Interfaces

7.1 Overview

7.2 Connection and Setting

7.3 Communication Specifications

7.4 @ Commands

 7.4.1 Start @3: Field 0

 7.4.2 Stop @2

 7.4.3 Abort @1

 7.4.4 Error reset @4

 7.4.5 Homing offset position setting @10

 7.4.6 Jog move command @11: Field 0

 7.4.7 Other convenient commands

7.5 Parameter Commands

7 RS232C Interfaces

7.1 Overview

The CN1 RS232C communication connector is provided in order to make connection with host devices such as PCs and PLCs via the RS232C. The *operation display pendant* (abbreviated as TBX, optional device) can also be connected to this connector. Refer to Chapter 9, “Operation Display Pendant” for a description of how to use the operation display pendant. This chapter explains how to connect the CN1 RS232C communication connector to devices other than the operation display pendant.

In the RS232C interface, two communication modes are available. The first is a *single channel communication* where the connection is made 1:1 with the host device, and the other is a *multi-channel communication* where 1:N communication can be performed by connecting one host device with several of these drivers (a maximum of nine). Please note that the connection and operation methods are different for each communication mode.

In addition, the *PC utility* (optional) running under Windows can also be connected to the drivers via the RS232C interface in order to support setting, operation, and maintenance work on the drivers. Refer to Chapter 8, “DrvGII PC Utility” for a description of how to use the PC utility.

7.2 Connection and Setting

[Connectors and terminal assignment]

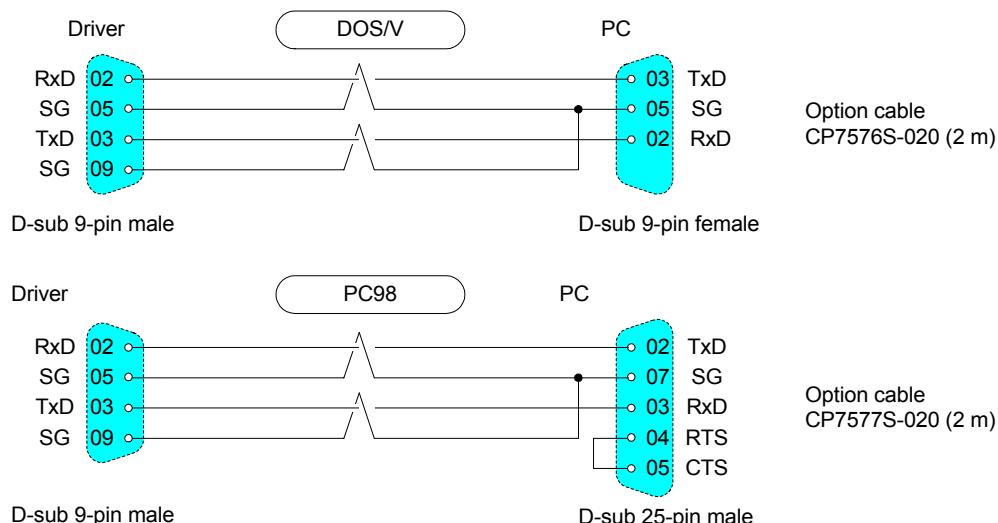
Made by Japan Aviation Electronics
DELC-J9SAF13L6 (9 pins)

01	FG	06	XTBXON
02	RxD	07	XTBXEMG
03	TxD	08	+5V
04	(NC)	09	SG
05	SG		

) Do not use these connections,
since they are used for the
operation display pendant.

[Single channel]

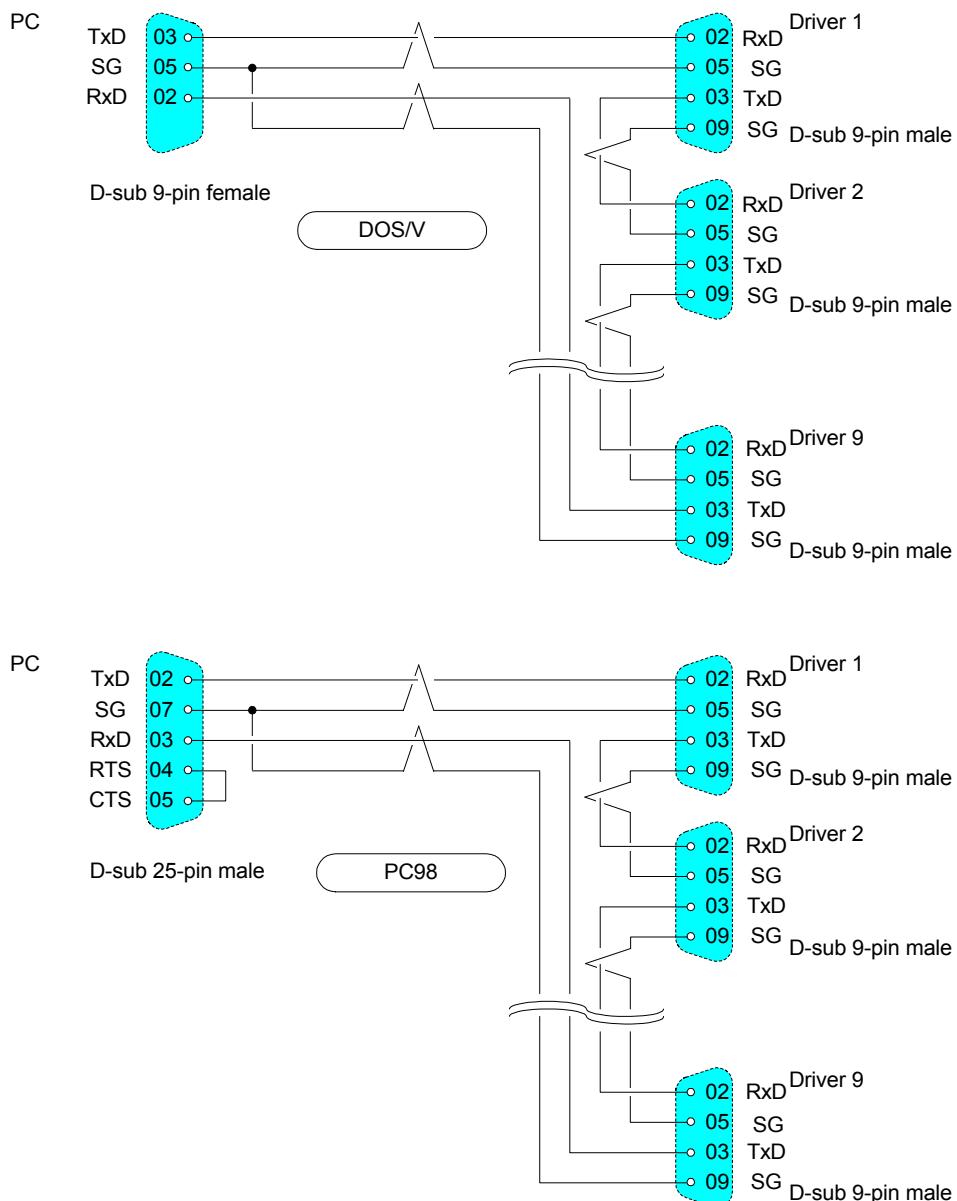
The connection cables (optional) are available according to the PC to be connected (DOS/V, NEC PC98).



In order to set the communication mode to the single channel mode, the rotary switch RS-ID on the front panel should be turned to “0.” This setting should be made before turning the power on.

[Multi-channel]

When preparing for multi-channel communication, connect the host device and a maximum of nine drives in a loop shape as shown in the figure below.



In multi-channel communication, the host device is assigned to **host ID “0.”** The drivers should be set as **slave stations** and the **IDs** should be set for each driver from “1” to “9” in such a way that the station numbers do not overlap, using the rotary switch RS-ID on each driver’s front panel. The order of the IDs does not need to be the same as the order of connection. This setting should also be made before turning the power on.

7 RS232C Interfaces

7.3 Communication Specifications

[Communication parameters]

Communication method	Start-stop system, text communication
Communication speed	9600 bps
Stop bit	1 bit
Data length	8 bits
Parity	None
Terminate	CR (both transmission and reception)
Flow control	None

[Single channel and multi-channel]

	Single channel	Multi-channel
Topology	Cross	Ring
ID	Unnecessary	Host device 0 Drivers 1 to 9
Destination specification	Unnecessary	Add the destination ID at the beginning of the packets From the host device to drivers: n****CR (n: slave station ID) From drivers to the host device: 0n****CR (n: slave station ID)

[Transmission from the host device to drivers]

The number of characters to be transmitted should be 128 letters or less, including the slave station ID, recognition key, transmission character string, and CR.

Single channel	Recognition key	Transmission character string	CR	
Multi-channel	Slave station ID	Recognition key	Transmission character string	CR

[Response from drivers to the host device]

The number of response characters should be 128 letters or less, including 0, slave station ID, recognition key, transmission character string, and CR.

Single channel	Recognition key	Response character string	CR		
Multi-channel	0	Slave station ID	Recognition key	Response character string	CR

[Recognition key]

The recognition key is a function provided so that the host device can recognize that a response is a reply to a specific transmission by the host device. A maximum of 15 “!” characters can be included in the recognition key part. If more than 15 are added, the remainder of the number divided by 16 is processed as the actual recognition key number.

When the host device transmits a message to a driver and attaches N recognition keys to the transmission character string, the driver will send a response message back in which it attaches N recognition keys to that transmission character string. If, for instance, the host device issues a transmission character string to a driver that does not generate an immediate response, the host device may issue the next transmission character string before the response is returned. In such cases, it becomes difficult for the host device to recognize to which transmission character string the response character string returned afterward is issued. In this case, by issuing transmission character strings with different recognition key numbers, it becomes possible to judge to which transmission character string a particular response corresponds, simply by obtaining the recognition key number as the response is received.

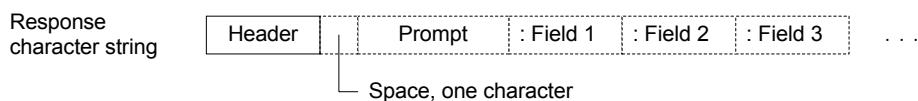
[Transmission character string]

Transmission character strings are classified as follows. The details about the @ commands and parameter commands will be explained separately in Section 7.4, “@ Commands” and Section 7.5, “Parameter Commands.”

	Explanation	Receivable status
@ commands	Commands for operating the driver	Receivable status changes depending on the command.
Parameter commands	Commands for setting parameters and reading parameter/monitor values.	Receivable status changes depending on the parameter.

[Response character string]

A response character string is structured as follows.



Response character strings are classified as follows.

	Header structure	□ part	■ part	Explanation
General	R□■	Number of fields	For the field expression method; see the note.	Normal response character strings to a transmission character string. The number of fields changes depending on the content of the response.
Error	ERR□□.■			Response character string to a transmission character string at error and alarm.
Alarm	ALM□□.■	Error/alarm code (main)	Error/alarm code (sub)	Fields never exists.

Note: In case of a general response the ■ part of the field is expressed in one of the following ways:

- O: In case there is no field
- D: Character string expressed in decimal
- B: Binary expression (8, 16, 32 digits)
- H: Hexadecimal expression (2, 4, 8 digits)
- S: Character string
- Z: Other than above (character string, etc.)

The following shows some examples of response character strings.

R00
R1D Position control bandwidth: 12
R1B Sensor group signal status: 00010000
ERR30.0 Servo not ready
ALM60.0 Cannot interpret command

7 RS232C Interfaces

7.4 @ Commands

Command format

@	Command number	: Field 0	: Field 1	: Field 2	...
---	----------------	-----------	-----------	-----------	-----

Command name	Command No.	No. of fields	Response at normal operation
Abort	1	0	R00
Stop	2	0	
Start	3	1	
Error reset	4	0	
Homing offset position setting	10	0	
Jog move command	11	1	

7.4.1 Start @3: Field 0

Start commands begin operating actions other than jog moves. For argument 0, set a numeric value corresponding to the content of the operation to be performed.

A response is issued when the corresponding operation is complete. In case of operations that do not end by themselves, such as test operations, perform the next operation without waiting for the response.

Operating action name	Command	No. of fields
Test operation	@3:0	1
Auto-tuning operation	@3:1	1
Homing move	@3:3	1
Mechanical setting mode	@3:15	1

7.4.2 Stop @2

Stop commands are used to end operating actions other than jog moves. They can be issued via the RS232C interface when the setting of the operation mode has given the main operation authority to the RS232C interface. The driver's response to stop commands varies depending on the current operating action. Refer to the table below.

The response is issued immediately.

Operating action name	Driver response
Test operation	Ends the operation when the motor returns to the start position.
Auto-tuning operation	Ends the operation when the oscillation command to the motor is completed.
Homing move	Immediately decelerate and stop the move, and ends the operation.
Mechanical setting mode	Invalid because this operation cannot be completed (ignored).

7.4.3 Abort @1

The abort command stops operating actions other than jog moves. It functions irrespectively of the operation mode.

Unlike with the stop commands, the motor immediately decelerates and stops, and the operating action is ended even during an operation that involves movement. When the M function is being executed, the abort command stops the execution and ends the operating action.

The response is issued immediately.

7.4.4 Error reset @4

The error reset command cancels error statuses of the driver. It functions irrespectively of the operation mode. It can only be run while in the *idle status*.

Depending on the error content, there are errors that cannot be canceled or errors that cause the same errors again immediately after being canceled.

The response is issued immediately.

7.4.5 Homing offset position setting @10

The homing offset position setting command instructs the #29 *Offset distance from the home position* parameter to auto-set so that the current motor position will become the position after homing is completed from the next time. It functions irrespectively of the operation mode. It can only be run while in the *idle* status.

When the command is issued, the current command unit command value and the value of the #29 parameter at that point are added. This value is temporally stored in the #29 parameter.

The response is issued immediately.

7.4.6 Jog move command @11: Field 0

The jog move command is for performing jog operations. This command can be executed in the *idle* status when the #217 *Jog move operation: RS232C selection* parameter is set so that operations are performed via the RS232C interface.

When field 0 contains “1” a move in the + direction is commanded, when it contains “-1” a move in the - direction is commanded, and when it contains “0,” a stop command is issued.

In the idle status, a jog move is performed as commanded by this command. If a start command is issued during a jog move, the move is immediately decelerated and stopped, after which the operation is started. If the operation is ended after that, the motor remains stopped regardless of the jog move status before starting the operation.

The response is issued immediately.

7.4.7 Other convenient commands

Command name	Command No.	Number of fields	Response at normal operation
Status request	0	1	R3H
Software driver reset	96	0	None

[Status request] @0:0

This command notifies the status of the driver. It functions irrespectively of the operation mode. The response is issued immediately.

Response character string: R3H:driver status:execution program number:execution block number

Driver status

Bit No.	Content	Value	
		0	1
0	Operation mode	PLC	RS232C
1	Servo ready	Not ready	Ready
2	Operation is being executed	Not being executed	Being executed
3	Axis operation is being executed	Not being executed	Being executed
9	Mechanical setting mode is being executed	Not being executed	Being executed
16	Error status	Not in error status	Error status
17	Alarm status	Not in alarm status	Alarm status
Others	(Reserved)		

[Software driver reset] @96

This command is software equivalent to turning the power to the driver off and on.
There is no response.

7.5 Parameter Commands

Through the use of parameter commands, it is possible to refer to values of parameters and monitor (*reference commands*), assign numerical values and variables to parameters (*simple setting commands*), and assigning results of arithmetic operations on numerical values and variables to parameters (*calculation result setting commands*). The response is issued immediately.

A reference command issues a transmission character string simply containing a variable given directly by #***. At normal operation, if a response is generated, a response character string that begins from “R1□” and one data is returned.

In simple setting commands and calculation result setting commands, the left-hand side must be variables expressed by #***. The right-hand side can be direct numerical values, or it can contain variables such as a parameter/monitor referred to by #***. The response at normal operation is “R00.”

[Reference commands]

#□	Reads the value of parameter #□	Response character string: R1D □ : □
#□	Reads the value of monitor #□	Response character string: R1B □ : 00010000

[Simple setting commands]

#400=□	Sets □ to variable #400.
#400=#□	Sets the value stored in #□ to variable #□.

[Calculation result setting commands]

The following operands can be used:

+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Remainder at integer division

#□ = □ + □	Sets the result of adding □ and □ to variable #□.
#□ = □ - □	Sets the value obtained by subtracting □ from the value stored in #□ to variable #□.
#□ = □ * #□	Sets the result of multiplication of □ and the value stored in #□ to variable #□.
#□ = □ / #□	Sets the value obtained by dividing the value stored in #□ by the value stored in #□ to variable #□.
#□ = □%#□	Sets the remainder of □ divided by □ to variable #□.

Chapter 8

DrvGII PC Utility

8.1 Overview

- 8.1.1 Overview of the Operation Menu
- 8.1.2 Overview of the Action Menu
- 8.1.3 Overview of the Data Management Menu

8.2 Installation

- 8.2.1 Installation under Windows 95/98/98SE/Me/NT4.0/2000
- 8.2.2 Starting the PC Utility

8.3 Preparation

- 8.3.1 Selecting a Communication Port
- 8.3.2 Selecting Channels
- 8.3.3 Displaying Communication Strings
- 8.3.4 Main Menu

8.4 Operation Menu

- 8.4.1 Terminal
- 8.4.2 Servo Tuning
- 8.4.3 Oscilloscope

8.5 Action Menu

- 8.5.1 Homing
- 8.5.2 Jog Move
- 8.5.3 Test Operation

8.6 Data Management Menus

- 8.6.1 Parameter Manager
- 8.6.2 I/O Set
- 8.6.3 Pulse Set

8.1 Overview

The DrvGII PC Utility consists of three components that are accessed from the following menus: “*operation menu*,” “*action menu*,” and “*data management menu*.”

8.1.1 Overview of the Operation Menu

The operation menu contains the following three functions :

- **Terminal:**

This menu allows you to send and receive character strings to/from the G2 driver (hereinafter referred to as the “driver”), monitor parameters/monitors as well as errors/alarms, and use parameter/command help.

- **Servo control:**

This menu allows you to adjust the servo parameters of the motor through auto-tuning and manual tuning. It also allows you to adjust various compensation filters.

- **Oscilloscope:**

This function displays graphs of time-series of parameter/monitor values.

8.1.2 Overview of the Action Menu

In the action menu, you can set and display parameters, display monitors, and start or stop actions related to the operations listed below.

“*Homing move*,” “*jog move*,” and “*Test operation*.”

8.1.3 Overview of the Data Management Menu

The data management menu contains the following seven functions:

- **Parameter:**

This function allows you to save all the parameters to files and register them from files. It also allows you to edit the machine setting parameters.

- **I/O set:**

This function allows you to set the logical setting of I/O points.

- **Pulse setting:**

This function allows you to perform various parameter settings related to pulses.

- **Absolute precision compensation:**

This function allows you to edit, register, and save absolute precision compensation data.

(This setting is valid if the absolute precision option is set to “yes,” with which the absolute precision of the motor is compensated for the entire circumference.)

8.2 Installation

8.2.1 Installation under Windows 95/98/98SE/Me/NT4.0/2000

The DrvGII utility (hereinafter referred to as the “PC utility”) runs on Windows 95, 98, 98SE, Me, NT4.0 and 2000. It can be installed via “Add/Remove Programs” under the “Control Panel” in Windows. If an older version of the PC utility is present, delete it first and then install the new version.

Display the “Properties of Adding/Removing Programs” dialog box and click “**Set Up (1)**.” Then proceed according to the instructions displayed on the screen. The PC utility setup program starts up.

Proceed with the setup according to the instructions on the screen. A dialog box for determining the directory in which to install the PC utility appears (see Figure 8.1).

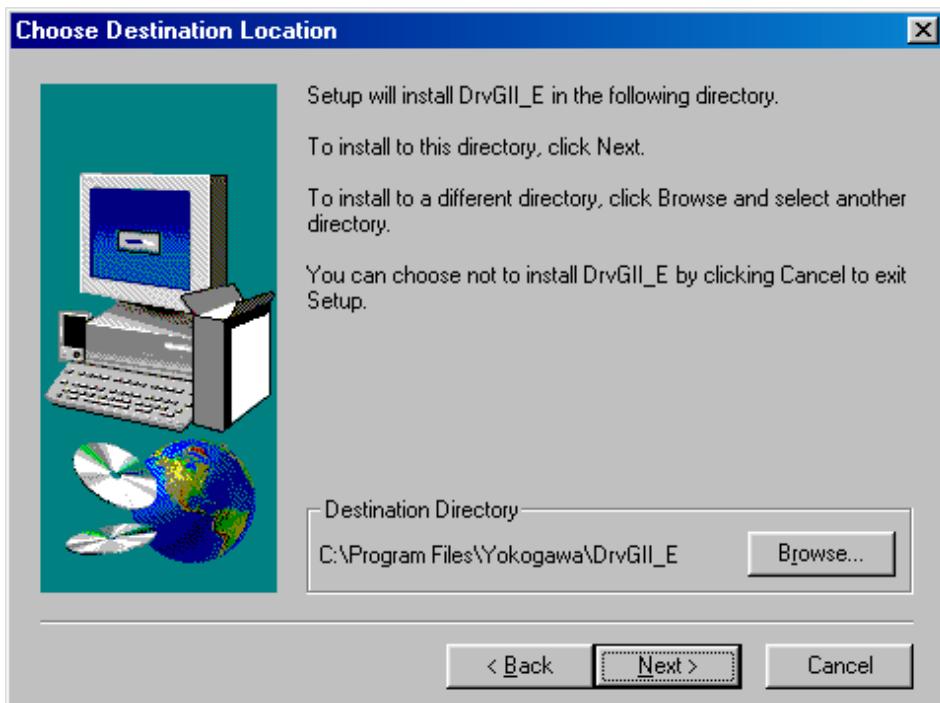


Figure 8.1 “Choose Destination Location” dialog box

Click “**Browse**” to display the “Select Directory” dialog box and select the desired drive and directory. Click “**Next**” to display “Select Program Folder” (see Figure 8.2).

8 DrvGII PC Utility

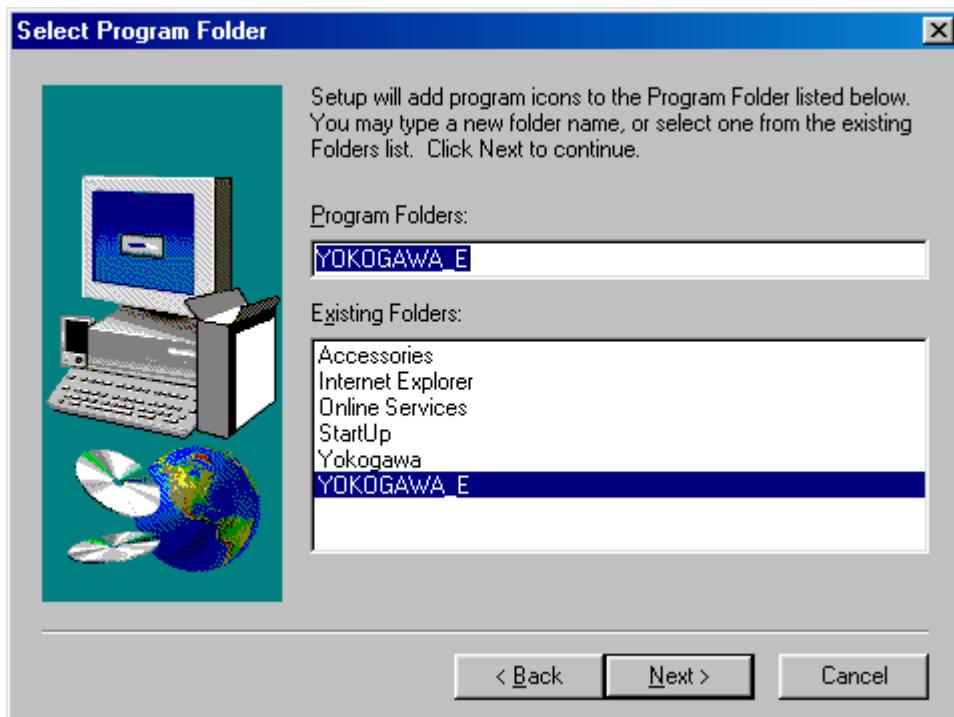


Figure 8.2 “Select Program Folder” dialog box

Select a program folder and click “*Next*.” The installation begins. Follow the instructions on the screen and change disks. When the setup is completed, the “Setup Complete” dialog box appear (see Figure 8.3).

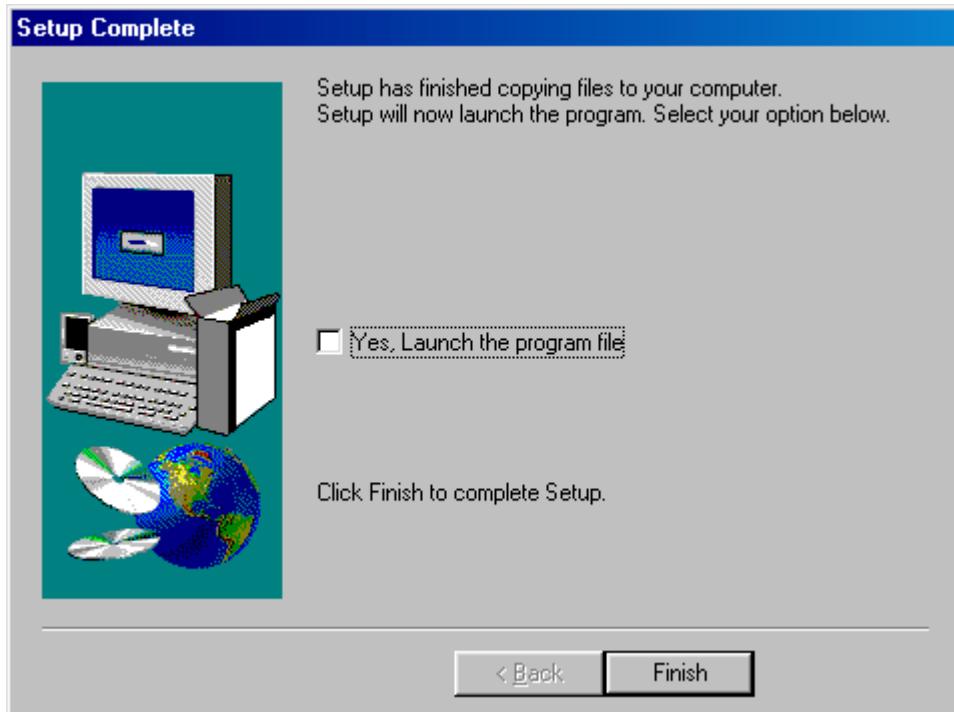


Figure 8.3 “Setup Complete” dialog box

To start the program, select “Launch program file” and click “*Finish*.” If you do not want to start the program, just click “*Finish*.” If you are prompted to restart the computer, simply follow the message and restart it.

8.2.2 Starting the PC Utility

In order to start the PC utility under Windows, click the “Start” button, “Program,” “Specified program folder,” and then “YOKOGAWA_E” The “Version Information” dialog box (see Figure 8.4) is displayed for several seconds, and the PC utility starts up. (By default, the specified program folder is “YOKOGAWA_E”)

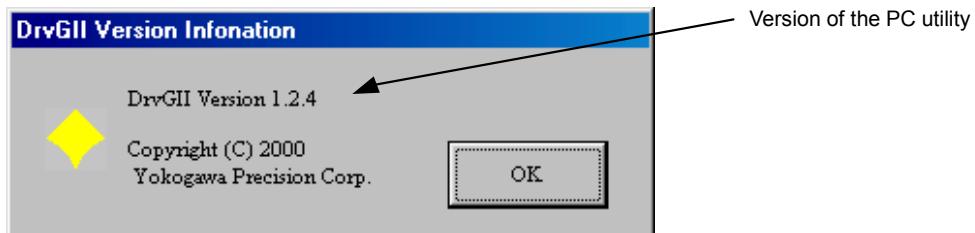


Figure 8.4 “Version Information” dialog box

8.3 Preparation

Connect the serial port of the PC with the serial port of the driver with a dedicated cable.
(Do not use any of commercially available cables. Since 5V power is being output from the driver as the power supply for the operation display pendant, a breakdown may occur in the PC if such cable is used.)

8.3.1 Selecting a Communication Port

When you start the PC utility, the “ComPortSelect” dialog box appears in the left side of the screen (see Figure 8.5). Change the setting according to the communication port of the connected PC.



Figure 8.5 “ComPortSelect” dialog box

Note: Settings made in the “ComPortSelect” dialog box are stored in a file. It is not necessary to make settings from the next time you start the PC utility. Change the setting as necessary.

8.3.2 Selecting Channels

When you start the PC utility, the “Communication mode” dialog box appears in the upper left corner of the screen (see Figure 8.6). If you are using one driver, select a single channel, and if you are using multiple drivers, select multi-channel addresses. (See Chapter 7 for how to make setting on the driver side.)



Figure 8.6 “Communication mode” dialog box

Note: The settings made in the “Communication mode” dialog box are not stored. When the PC utility is started up, a single channel is always set.

8.3.3 Displaying Communication Strings

When you start the PC utility, the “Communication string” dialog box appears in the upper right corner of the screen. (See Figure 8.7.) Any strings that the PC utility sends to the driver as well as any strings received from the driver are displayed regardless of the menu.

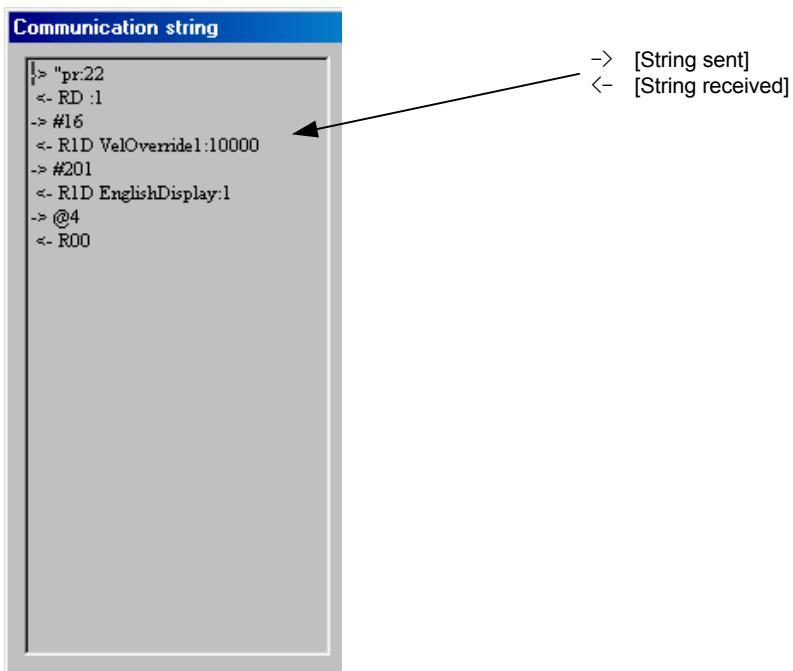


Figure 8.7 “Communication string” dialog box

8 DrvGII PC Utility

8.3.4 Main Menu

When you start the PC utility, the “MainMenu” dialog box appears (see Figure 8.8). See the following chapters for how to start the actual operation.

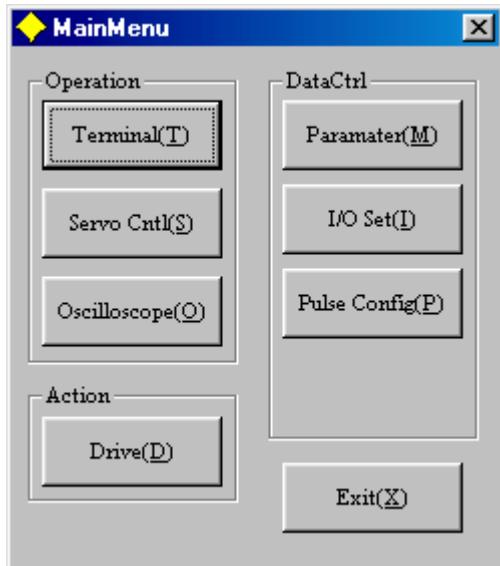


Figure 8.8 “MainMenu” dialog box

8.4 Operation Menu

8.4.1 Terminal

Using this menu, you can send and receive character strings to/from the driver, monitor parameters/monitors as well as errors/alarms, and use parameter/command help.

Click “**Terminal (T)**” under “MainMenu” to display the “Terminal” dialog box (see Figure 8.9).

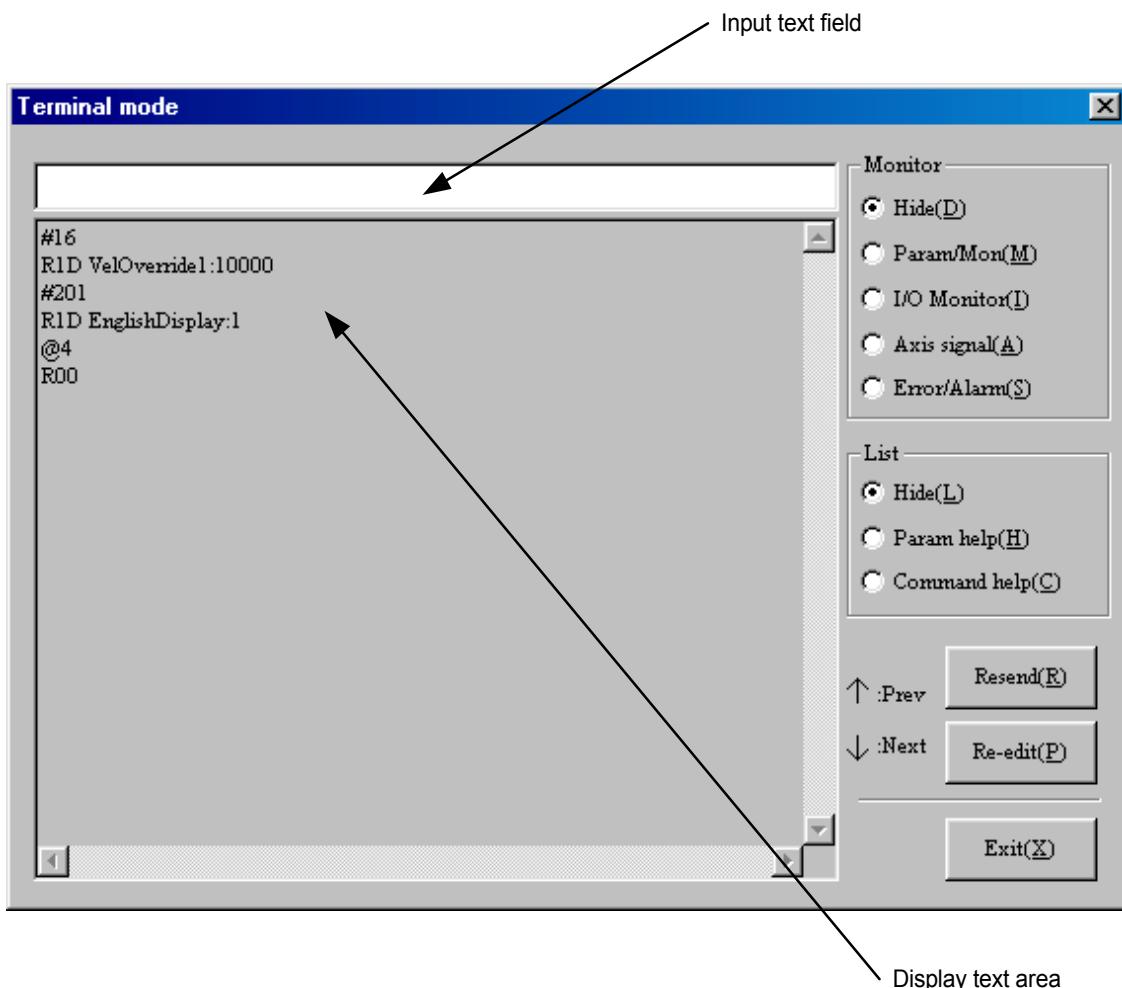


Figure 8.9 “Terminal” dialog box

[Sending/receiving character strings]

- 1) Enter a character string in the input text field and press the Enter (Return) key. The character string is sent to the driver and, at the same time, displayed in the display text area.
- 2) When a character string is received from the driver, it is displayed in the display text area.
- 3) If you click “**Resend (R)**,” the character string transmitted last time is sent again.
- 4) If you click “**Re-edit (P)**,” the character string transmitted last time is displayed in the input text field.
- 5) It is possible to display a maximum of ten transmitted character strings in the order of transmission in the input text field by pressing the ↑ arrow key on the PC keyboard. By pressing the ↓ arrow key, the character strings displayed by pressing the ↑ arrow key can be displayed in the reverse order.

8 DrvGII PC Utility

(1) Parameter/monitor

In the “Terminal” menu, click “*Parameter/Monitor (M)*” under “Monitor” to display the “Parameter/Monitor” dialog box (see Figure 8.10).

If the number of a parameter/monitor you want to monitor is entered in the parameter/monitor number text field, the contents and values of the corresponding parameters are displayed. Up to five parameters/monitors can be monitored, and they can be switched on and off by clicking their respective switch check boxes (the update cycle of the parameter/monitor values can be shortened by decreasing the number of parameters to be monitored).

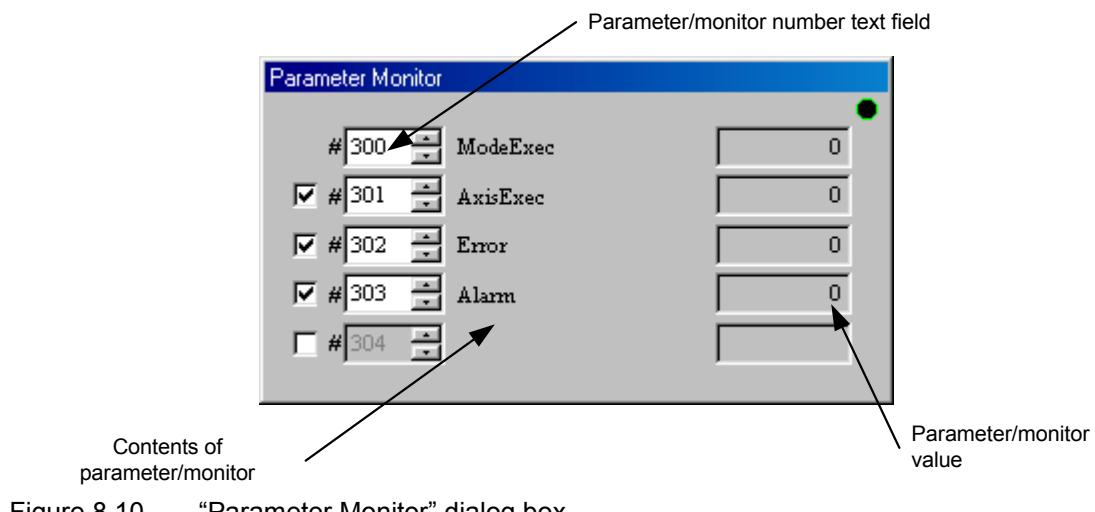


Figure 8.10 “Parameter Monitor” dialog box

(2) I/O monitor

In the “Terminal” menu, click “*I/O Monitor (I)*” under “Monitor” to display the “I/O Monitor” dialog box (see Figure 8.11).

With the “I/O Monitor” dialog box, it is possible to monitor the on/off status of DI and DO points. It displays the status of electrical I/O signals regardless of the I/O logic setting. For reference of DI and DO numbers and signal names, see Chapter 6.

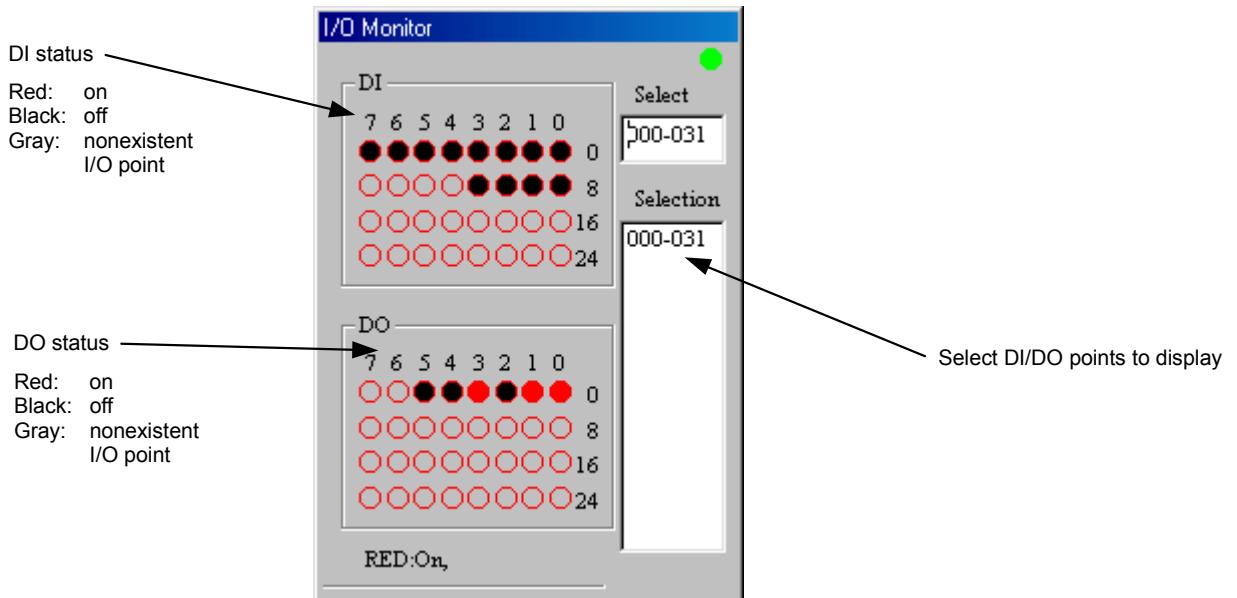


Figure 8.11 “I/O Monitor” dialog box

8 DrvGII PC Utility

(3) Axis signal status display

In the “Terminal” menu, click “Axis signal status (A)” under “Monitor” to display the “Axis signal status” dialog box (see Figure 8.12).

Via the “Axis signal status” dialog box, it is possible to monitor the axis status, etc. of the driver.

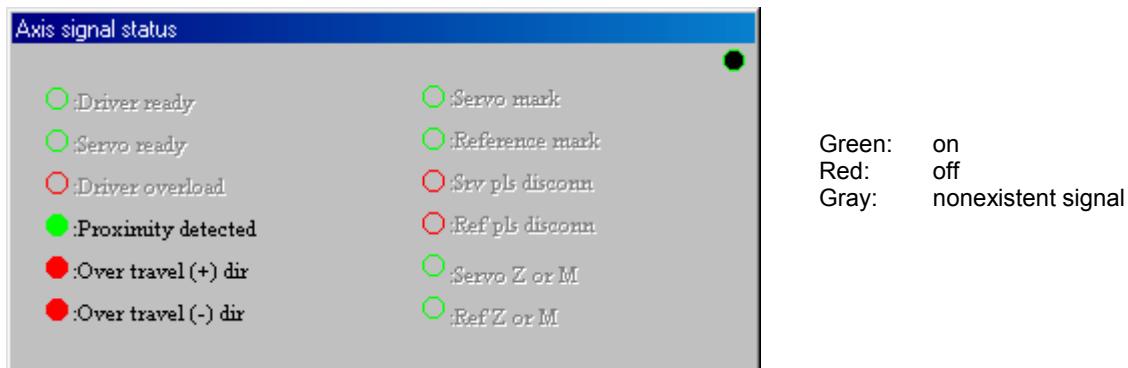


Figure 8.12 “Axis signal status” dialog box

(4) Error or alarm monitor

In the “Terminal,” click “Error or Alarm (S)” under “Monitor” to display the “Error or Alarm” dialog box (see figure 8.13).

When an error occurs, this dialog box displays “error message” and shows the error history in the display text area. When an alarm occurs, it displays “alarm message” and shows the alarm history in the display text area. In the display text area, the error history is displayed first, and a maximum of 16 errors/alarms is displayed.

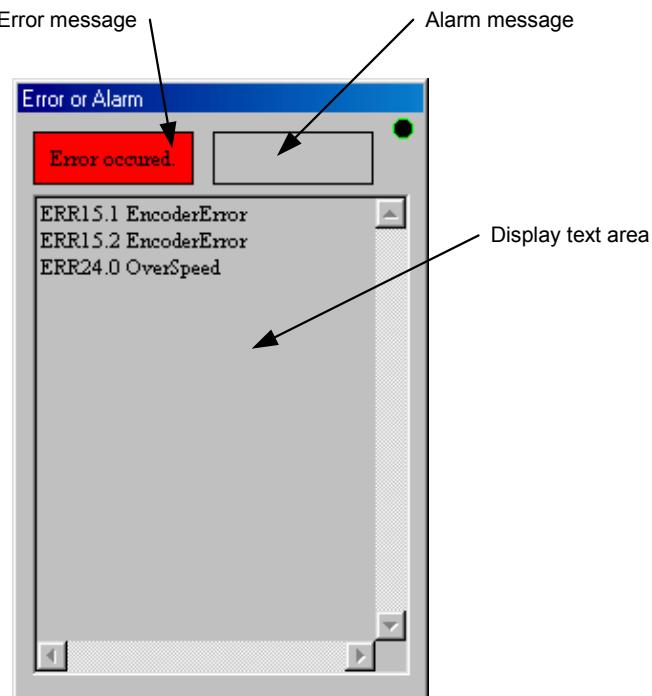


Figure 8.13 “Error or Alarm” dialog box

(5) Parameter/monitor help

In the “Terminal” menu, click “**Parameter/Monitor help (H)**” under “List” to display the “Parameter/Monitor help” dialog box (see Figure 8.14).

The Parameter/Monitor help can display the contents of a maximum of ten parameters/monitors. If you click “**Prev (P)**,” parameters/monitors with smaller numbers than the currently displayed parameters/monitors are displayed. If you click “**Next (N)**,” parameters/monitors with larger numbers than the currently displayed parameters/monitors are displayed.



Figure 8.14 “Parameter/Monitor help” dialog box

(6) Command help

In the “Terminal” menu, click “**Command Help (C)**” under “List” to display the “Command Help” dialog box (see Figure 8.15).

The Command Help can display the contents of a maximum of ten commands. If you click “**Prev (P)**,” commands with smaller numbers than the currently displayed commands are displayed. If you click “**Next (N)**,” commands with larger numbers than the currently displayed commands are displayed.



Figure 8.15 “Command Help” dialog box

8.4.2 Servo Tuning

This menu allows you to adjust the servo parameters of the motor through auto-tuning and manual tuning in addition to adjust various compensation filters

Click “**Servo Cntl (S)**” on “MainMenu” to display the “Servo Tuning” dialog box.

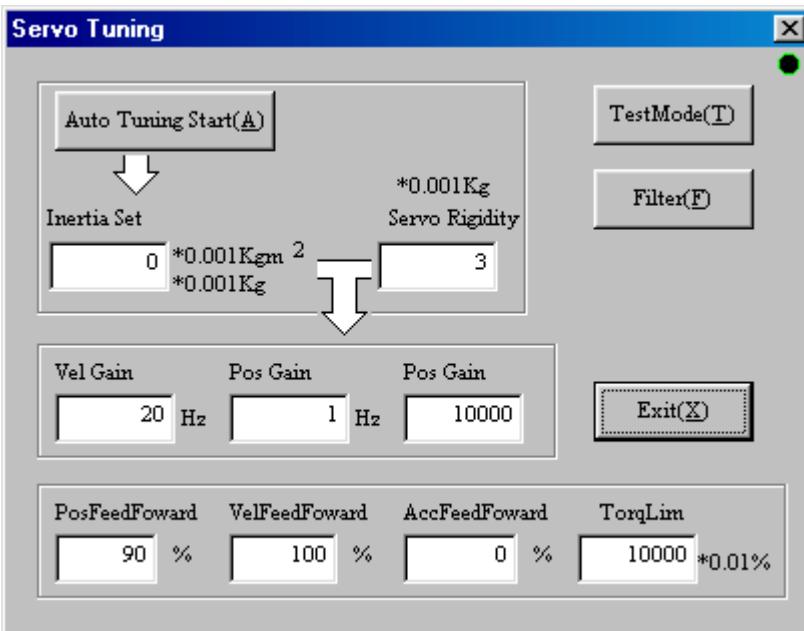


Figure 8.16 “Servo Tuning” dialog box

(1) Auto-tuning

- 1) Set the operation mode to the RS232C operation enable mode, and then turn on the power (see Chapter 5).
- 2) Set the motor to Servo ON (the operations until this point must be made before opening the “Servo Tuning” dialog box.)
- 3) Click “**Auto Tuning (A)**” to start the auto-tuning.
Note: The motor performs reciprocating movements in order to estimate the inertia and weight of the load (the operation width of the reciprocating movement can be changed in parameter <#32>). Please make sure that there are no interfering objects within the range of the operation width.
- 4) After performing reciprocating movement for several times, the estimation of the inertia and weight is completed and reflected in the parameter for inertia/weight.
- * By changing the servo stiffness setting parameter, three parameters – the velocity control bandwidth, position control bandwidth, and position control integral limiter – are changed and thus the servo stiffness changes.

(2) Manual tuning

- 1) Set the operation mode to the RS232C operation enable mode, and then turn on the power (see Chapter 5).
- 2) Set the motor to Servo ON (the operations until this point must be made before opening the “Servo Tuning” dialog box.)
- 3) Click “**Test Mode (T)**” to enter the test mode.
Note: The motor performs small width reciprocating movements (the operation width of the reciprocating movement can be changed in parameter <#32>). Please make sure that there are no interfering objects in the range of the operation width.
- 4) In the test mode, the driver monitors the waveform of the motor position by oscilloscope, etc., and manipulates three parameters – the velocity control bandwidth, position control bandwidth, and position control integral limiter – to tune the servo (see Chapter 5 for more details).

[Other parameters]

- * The three parameters – position feed forward, velocity feed forward, and acceleration feed forward – have no relation with servo stiffness. They are parameters for adjusting the settling time decrease.
- * The torque limiter parameter should be changed when limiting the motor torque.

(3) Filter setting

Click “**Filter (F)**” under “Servo Tuning” to display the “Filter” dialog box (see Figure 8.17).

The filter setting is divided into two sections, a first order delay filter setting and a notch filter setting.

- 1) To set the first order delay filter: Select one from None, 20/80, 30/120, and 40/160.
- 2) To set the notch filter: Manipulate the frequency setting scroll bar and set.
 - Clicking the arrows at either end: The frequency changes in steps of one.
 - Clicking between the slider bar and an arrow: The frequency changes in steps of ten.
 - Dragging the slider bar: The frequency is set to the value at the position to which the slider bar is moved.

* Refer to Chapter 5 for how to use the filters.

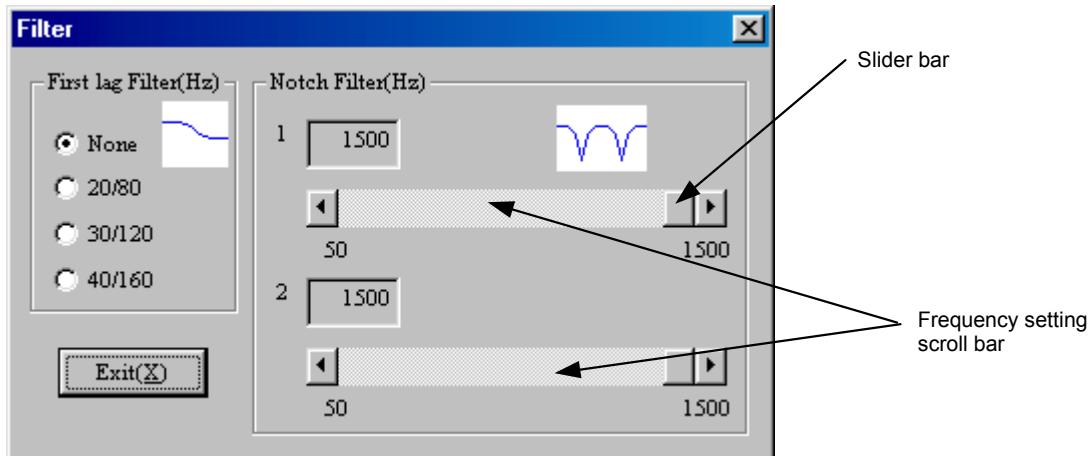


Figure 8.17 “Filter” dialog box

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8.4.3 Oscilloscope

The oscilloscope displays time-series of parameter/monitor values.

Click “Oscilloscope (O)” under “MainMenu” to display the “Oscilloscope” dialog box.

Note: The parameter/monitor information is obtained automatically from the driver when the “Oscilloscope” dialog is started. Please wait for a while until it becomes ready for use. (This operation is required only once for the initial use.)

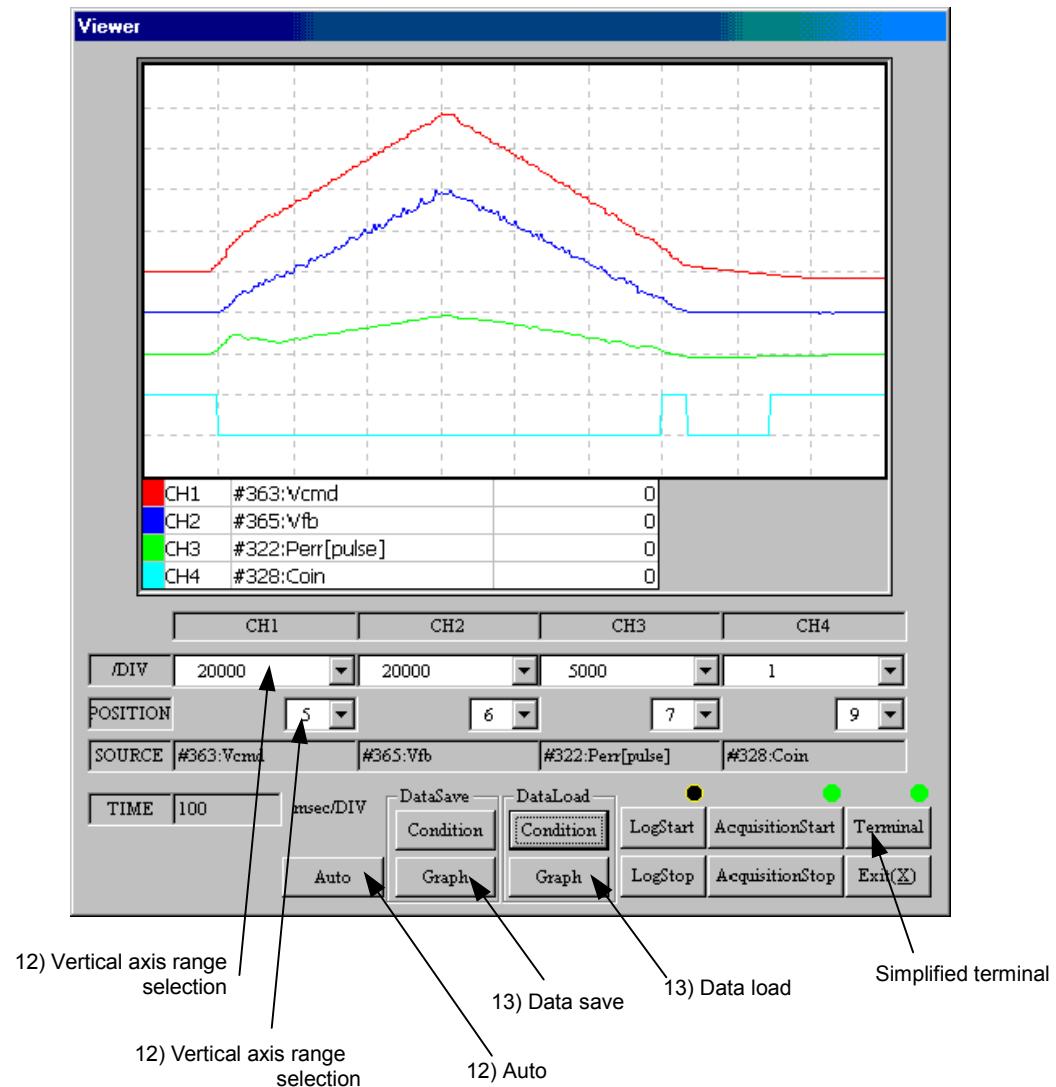


Figure 8.18 “Oscilloscope” dialog box

[How to use the oscilloscope]

- (1) Click “*Log Start*” on the “Oscilloscope” dialog box to display the “SetCondition/ELogStart” dialog box (see Figure 8.19).

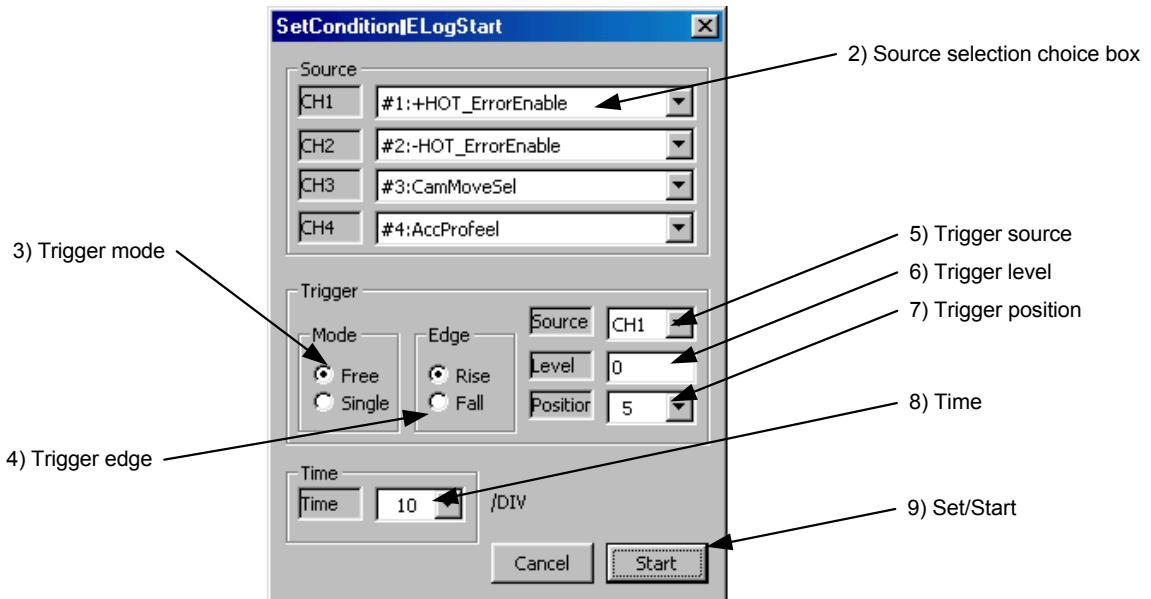


Figure 8.19 “SetCondition/ELogStart” dialog box

- (2) Click the ↓ to select the parameters/monitors you want to display in the “source selection choice box.” (CH1 to CH4)
- (3) Select a trigger mode.
Free: Obtains data immediately without using the trigger.
Single: Obtains data when the trigger conditions are met.
- (4) Select a trigger edge. (Valid when the trigger mode is Single.)
- (5) Click the ↓ to select a trigger source. (Valid when the trigger mode is Single.)
- (6) Enter a trigger level. (Valid when the trigger mode is Single.)
- (7) Click the ↓ to select a trigger position. (Valid when the trigger mode is Single.)
- (8) Click the ↓ to select a time (horizontal axis). (The unit is msec.)
- (9) Click “*Set/Start*” to return to the “Oscilloscope” dialog box and wait for the completion of data acquisition.
- (10) When the data is obtained, “*Start Acquisition*” becomes active.
- (11) Click “*Start Acquisition*” to extract data from the driver and display it in the “Oscilloscope” dialog box.

Note: If the set trigger conditions are not satisfied and “*Start Acquisition*” does not become active, click “*Log Stop*” and set the trigger conditions again.

- (12) The displayed waveform can be reshaped using "Display position selection" and "Vertical axis range selection" in the "Oscilloscope" dialog box.
When "*Auto*" is clicked at this time, the "Display position selection" value is changed to "5," and the "Vertical axis range selection" value is changed automatically to a value that enables to display the entire waveform as much as possible without cutting any part of the waveform.
- (13) When "*Condition and display*" under "Data save" is clicked, the status set in the "SetCondition/ELogStart" dialog box as well as the values set by "Display position selection" and "Vertical axis range selection" can be saved by assigning a file name.
In addition, when "*Graph*" under "Data save" is clicked, the waveform currently being displayed, the status set in the "SetCondition/ELogStart" dialog box, and the values set by "Display position selection" and "Vertical axis range selection" can be saved by assigning a file name.
- * The status set in the "SetCondition/ELogStart" dialog box as well as the values set by "Display position selection" and "Vertical axis range selection" are automatically saved in the "oscescope.cnd" file when the "Oscilloscope" dialog box is closed. When the dialog box is opened next time, it displays the previous setting values.
- (14) When "*Condition and display*" under "Data load" is clicked, the setting status of the "SetCondition/ELogStart" dialog box as well as the values set by "Display position selection" and "Vertical axis range selection" are loaded from files, and then displayed. The waveform is cleared at this time and all values are set to 0.
In addition, when "*Graph*" under "Data save" is clicked, the waveform data, the setting status in the "SetCondition/ELogStart" dialog box, and the values set by "Display position selection" and "Vertical axis range selection" are loaded from files, and then a waveform is displayed.

Note: If the trigger condition that has been set cannot be established and "Start acquisition" cannot be activated, click "Log stop" and set a new trigger condition again.

- * The simplified terminal function is provided in the "Oscilloscope" dialog box. Use this function in order to change parameter values or to start an operation.

8.5 Action Menu

In the operation menu, you can set and display parameters, display monitors, and start or stop actions related to the operations listed below.

“Homing move,” “jog move,” and “Test operation.”

Click “Drive (D)” under “MainMenu” to display the “DriveMenu” dialog box (see Figure 8.20).

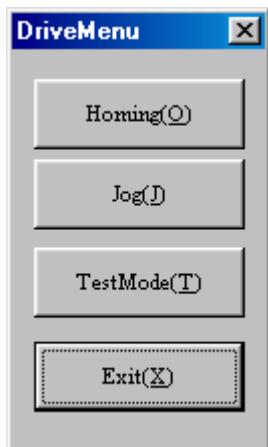


Figure 8.20 “DriveMenu” dialog box

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8.5.1 Homing

Click “Homing (O)” in the “DriveMenu” dialog box to display the “Homing” dialog box (see Figure 8.21). If the connection with the driver is established, the current values of the related parameters are read and can be edited.

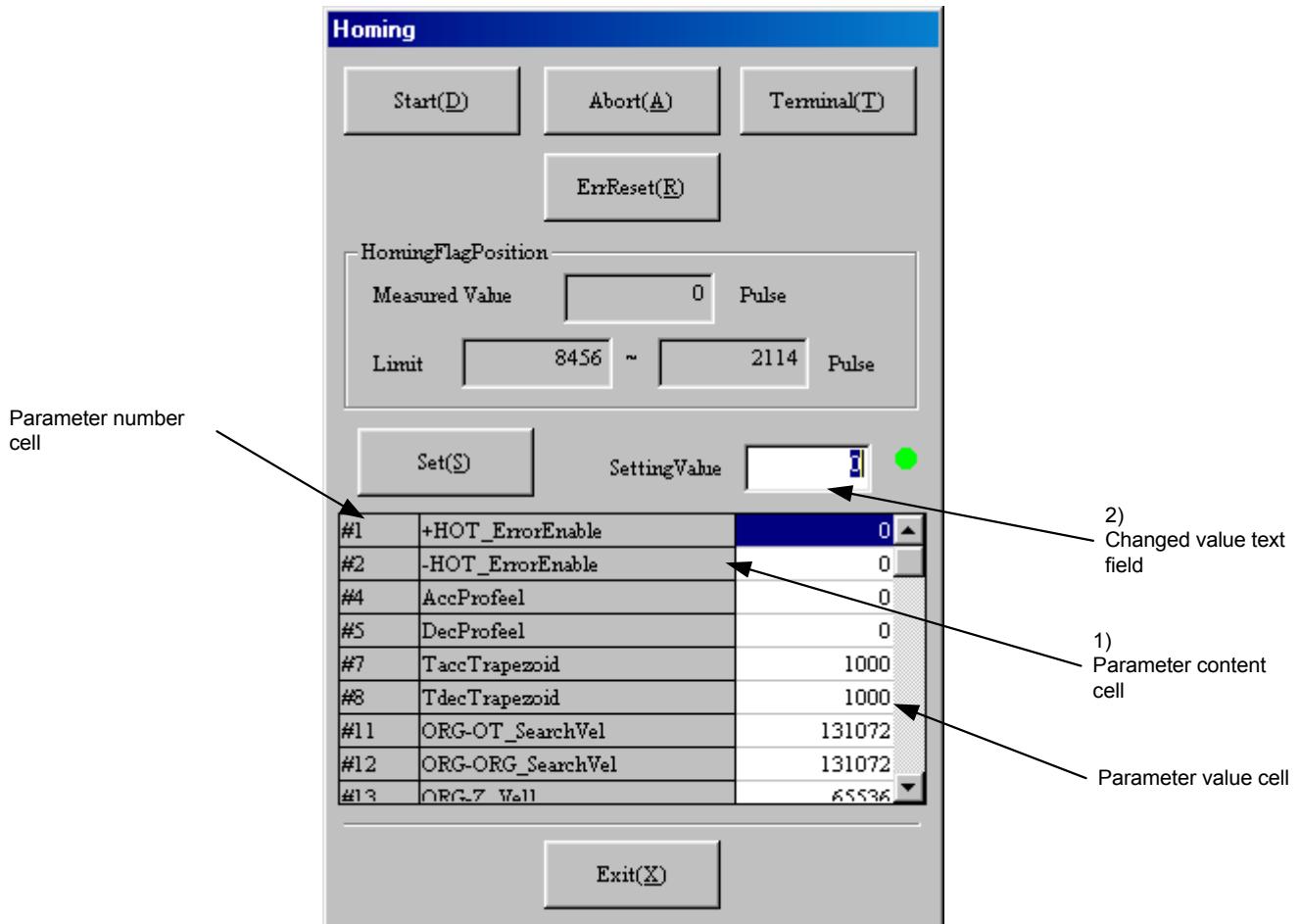


Figure 8.21 “Homing” dialog box

(1) Editing parameters

- 1) Click the parameter content cell of the parameter to be changed. The current value is displayed in the changed value text field.
- 2) Enter a value in the changed value text field and click the Enter (Return) key or click another cell to make the new parameter value valid.
- 3) Repeat steps 1) and 2) as necessary and click “Set (S)” to set the changed values in the driver. If there is an error in the set value, a warning message is displayed and the parameter is read again. Parameters whose setting values are erroneous will not be changed; therefore the changed parameters should be verified.

(2) Operation

The motor can be operated when the operation mode is set to the RS232C operation enable mode (see Chapter 5).
(When the RS232C operation disable mode is set, some buttons are disabled.)

[Start]

- 1) Set the motor to Servo ON (see Chapter 5).
- 2) Click “*Start (D)*.”
→ The measured value of the homing is displayed after the homing operation is finished.

[Abort]

- 1) Click “*Abort (A)*.”
→ The motor decelerates and stops.

[Error Reset]

- 1) Click “*ErrReset (R)*.”
→ Errors that can be recovered are canceled.

[Simplified terminal]

- 1) Click “*Terminal (T)*.”
- 2) Send or receive character strings.

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8.5.2 Jog Move

Click “Jog (J)” in the “DriveMenu” dialog box to display the “JogMove” dialog box (see Figure 8.22). If the connection with the driver is established, the current values of the related parameters are read and can be edited.

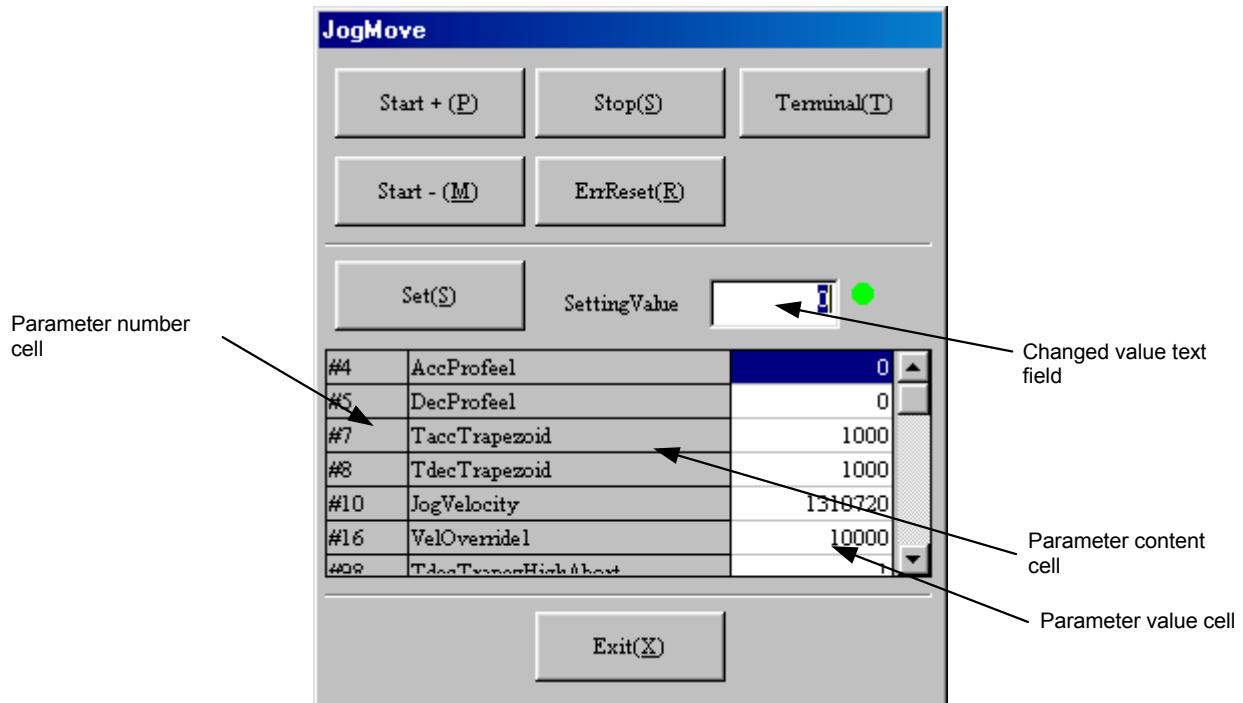


Figure 8.22 “JogMove” dialog box

(1) Editing parameters

- 1) Click the parameter value cell of the parameter to be changed. The current value is displayed in the changed value text field.
- 2) Enter a value in the changed value text field and click the Enter (Return) key or click another cell to make the new parameter value valid.
- 3) Repeat steps 1) and 2) as necessary and click “Set (S)” to set the changed values in the driver. If there is an error in the set value, a warning message is displayed and the parameter is read again. Parameters whose setting values are erroneous will not be changed; therefore the changed parameters should be verified.

(2) Operation

The following operation can be performed when jog move is selected via the RS232C interface (see Chapter 5).
(When the main operation mode is set to the PLC main operation mode, some buttons are disabled.)

[Jog move in positive direction]

- 1) Set the motor to Servo ON (see Chapter 5).
- 2) Click “*Start + (P)*.”

[Jog move in negative direction]

- 1) Set the motor to Servo ON (see Chapter 5).
- 2) Click “*Start – (M)*.”

[Jog stop]

- 1) Click “*Stop (S)*.”

[Error Reset]

- 1) Click “*ErrReset (R)*.”
→ Recoverable errors are canceled.

[Simplified terminal]

- 1) Click “*Terminal (T)*.”
- 2) Send or receive character strings.

8.5.3 Test Operation

To start a test operation, click “*TestMode (T)*” under “DriveMenu.” This function is the same as the ‘test operation’ of servo tuning.

Note: The motor performs reciprocating motions with fine width. (The operating width of reciprocating motions can be changed with the parameter <#31>.) Be sure that there are no obstacles within the range of the operating width.

8.6 Data Management Menus

8.6.1 Parameter Manager

This menu allows you to save all the parameters to files and register them from files in addition to edit the machine setting parameters.

Click “Parameter (M)” under “MainMenu” to display the “Parameter Manager” dialog box (see Figure 8.23).



Figure 8.23 “Parameter Manager” dialog box

(1) Editing machine parameters

Click “*Machine Parameter Edit (M)*” in the “Parameter Manager” dialog box to display the “MachineParameterEdit” dialog box (see Figure 8.24). If the connection with the driver is established, the current values of the machine parameters are read and can be edited.

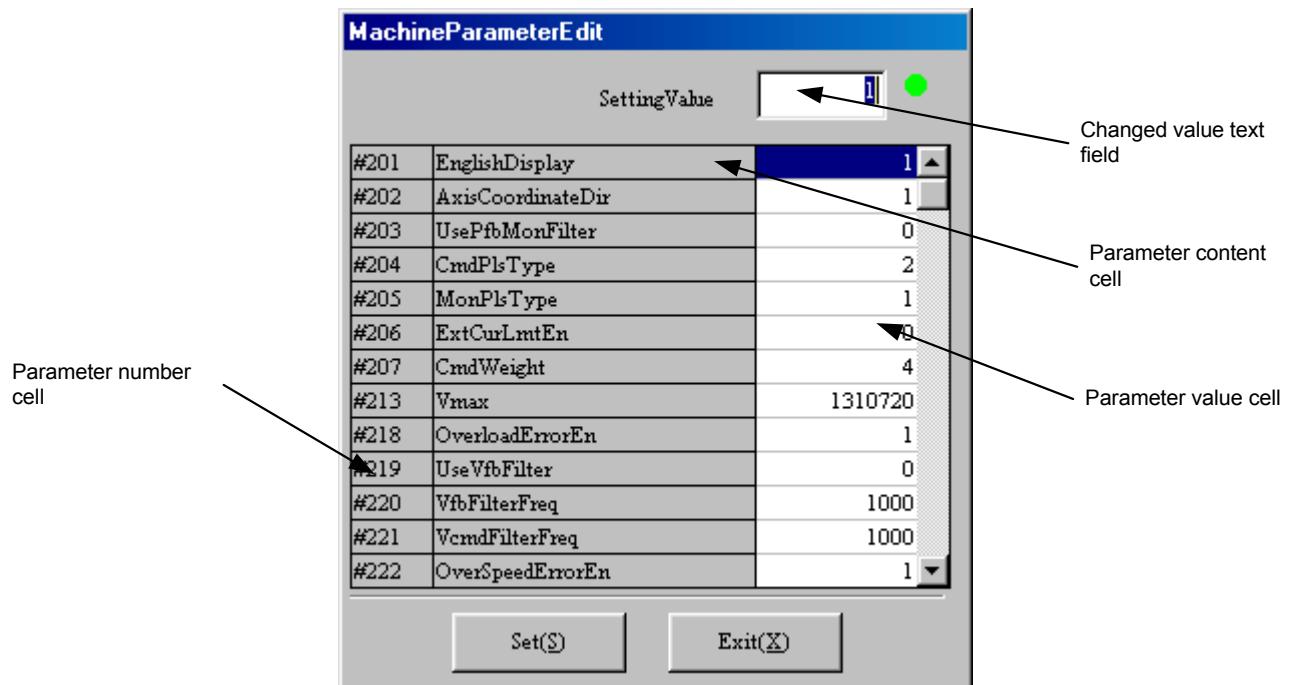


Figure 8.24 “MachineParameterEdit” dialog box

[Editing]

- 1) Click the parameter value cell of the parameter to be changed. The current value is displayed in the changed value text field.
- 2) Enter a value in the changed value text field and click the Enter (Return) key or click another cell to make the new parameter value valid.
- 3) Repeat steps 1) and 2) as necessary and click “*Set (S)*” to start downloading to the driver. (If you click “*Exit (X)*,” the parameter values are not changed.)
- 4) When the downloading is finished, follow the message and reset the driver.

Note: If any erroneous data are set, the parameters that could not be downloaded are displayed. In this case, reset the driver once and set the parameters again.

Note: In the case of the machine setting parameters, the changed values cannot be updated until you reset the driver.

(2) Uploading (from the driver to a file)

- 1) Click “*Upload (U)*” in the “Parameter Manager” dialog box.
- 2) Enter the name of the file to which parameters are to be saved. Do not enter a file extension (*.prm); it is added automatically.
- 3) Click “*Save (S)*” to start uploading. If you wish to stop the uploading, click “*Cancel*.”

(3) Downloading (from a file to the driver)

- 1) Click “Download (D)” in the “Parameter Manager” dialog box.
- 2) Enter the name of the file to be downloaded to the driver. Do not enter a file extension (*.prm); it is added automatically.
- 3) Click “Open (O)” to start downloading. If you wish to stop the downloading, click “Cancel.”
- 4) When the downloading is finished, follow the message and reset the driver.

(4) Displaying the file contents

- 1) Click “View file (V)” in the “Parameter Manager” dialog box.
- 2) Enter the name of the file you want to display. Do not enter a file extension (*.prm); it is added automatically.
- 3) Click “Open (O)” to begin displaying the file contents in the “Parameter file display” dialog box (see Figure 8.25).
- 4) If you want to print the file, click “Print (P).”
- 5) Click “Exit (X)” and return to the “Parameter Manager” dialog box.

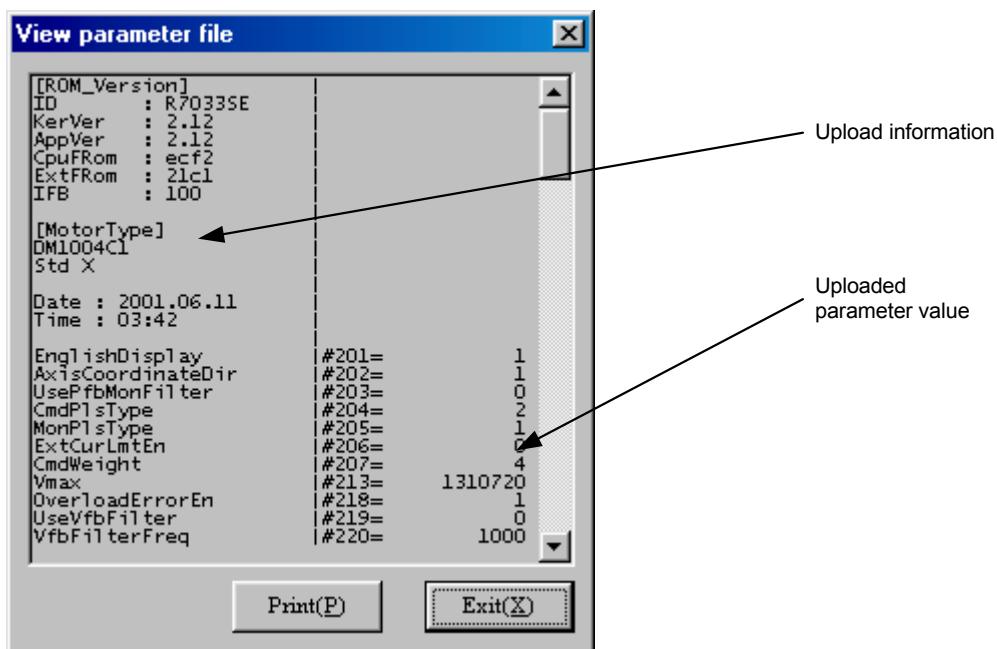


Figure 8.25 “Parameter file display” dialog box

(5) Resetting the communication

If the communication with the driver finishes abnormally, click “Reset Com (R)” in the “Parameter Manager” dialog box to return to the normal status.

8.6.2 I/O Set

In this menu, you can set the logical setting of DI/DO points (For reference of DI and DO numbers and signal names, see Chapter 6.).

Click “I/O set (I)” under “MainMenu” to display the “I/O configuration” dialog box (see Figure 8.26).

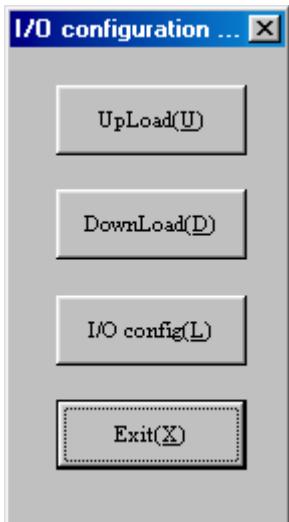


Figure 8.26 “I/O configuration” dialog box

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(1) Logical setting

- 1) Click “*I/O config (L)*” in the “I/O configuration” dialog box.
- 2) The “Discrete configuration” dialog box is displayed and the current setting status is read. (The maximum number of setting statuses that can be displayed at once is 32 points for both DI and DO.)

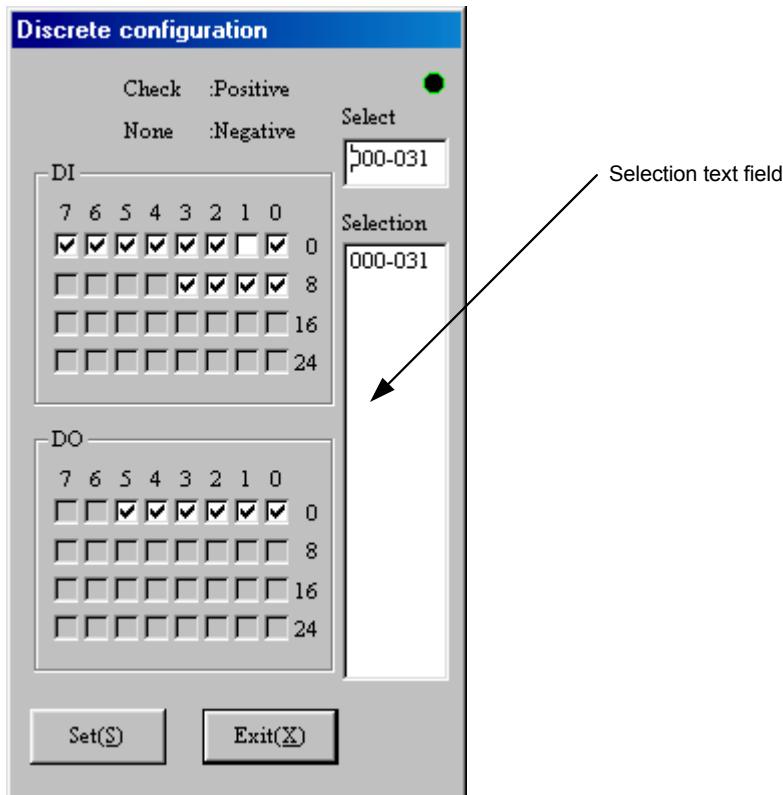


Figure 8.27 “Discrete configuration” dialog box

- 3) Click a number you want to display from the selection text field in order to display the logical setting of that number.
- 4) Click the check boxes of the I/O points to change the logical setting.
Note: An I/O point with a check mark is set to positive logic (A contact) and an I/O without a check mark is set to negative logic (B contact).
- 5) Click “*Set (S)*.”
- 6) When the setting is completed, follow the message and reset the driver.

(2) Uploading (from the driver to a file)

- 1) Click “*Upload (U)*” in the “I/O configuration” dialog box.
- 2) Enter the name of the file to which I/O configuration is to be saved. Do not enter a file extension (*.ioc); it is added automatically.
- 3) Click “*Save (S)*” to start uploading. If you wish to stop the uploading, click “*Cancel*.”

(3) Downloading (from a file to the driver)

- 1) Click “*Download (D)*” in the “I/O configuration” dialog box.
- 2) Enter the name of the file to be downloaded to the driver. Do not enter a file extension (*.ioc); it is added automatically.
- 3) Click “*Open (O)*” to start downloading. If you wish to stop the downloading, click “*Cancel*.”
- 4) When the downloading is finished, follow the message and reset the driver.

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8.6.3 Pulse Set

(1) Pulse setting

- 1) Click “*Puls Config (P)*” in the “Main Menu” dialog box.
- 2) The “Puls configuration” dialog box is displayed and the current setting status is read.

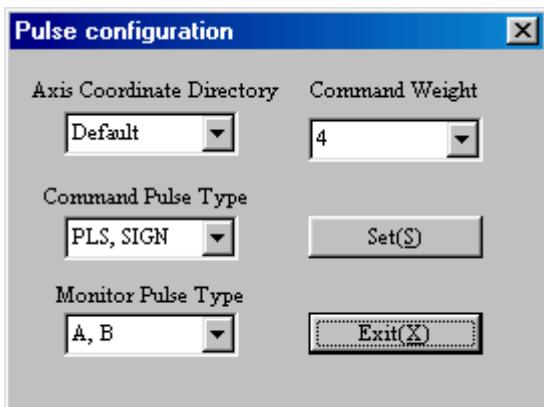


Figure 8.28 “Puls configuration” dialog box

- 3) Select the parameter from the combobox.
- 4) Click “*Set (S)*” to start downloading the selected parameter to the driver.
- 5) When the downloading is finished, follow the message and reset the driver.

Chapter 9

Operation Display Pendant

- 9.1 Overview
- 9.2 Features and Part Names
- 9.3 Switching Displays
- 9.4 Terminal Mode Display
- 9.5 Parameter Monitor Display
- 9.6 Parameter Settings Display
- 9.7 I/O Monitor Display
- 9.8 Special Command Display

9 Operation Display Pendant

9.1 Overview

The operation display pendant (abbreviated as TBX, optional device) should be connected to the CN1 RS232C communication connector. It is set to the same status as the single channel communication in the RS232C interface, regardless of the setting status of the rotary switch RS-ID on the front panel.

The following functions are provided for the operation display pendant.

- **Terminal mode display:**

In this display, you can send @ commands and parameter commands in the same way as with the RS232C interface and display response character strings.

- **Parameter monitor display:**

In this display the updated contents of parameters/monitors referred to by #*** can be displayed repeatedly.

- **Parameter settings display:**

In this display, you can make changes to parameters referred to by #***, if they can be written to.

- **I/O monitor display:**

In this display the updated I/O status of the PLC interface and the signal status of the TB2 sensor/break can be displayed repeatedly.

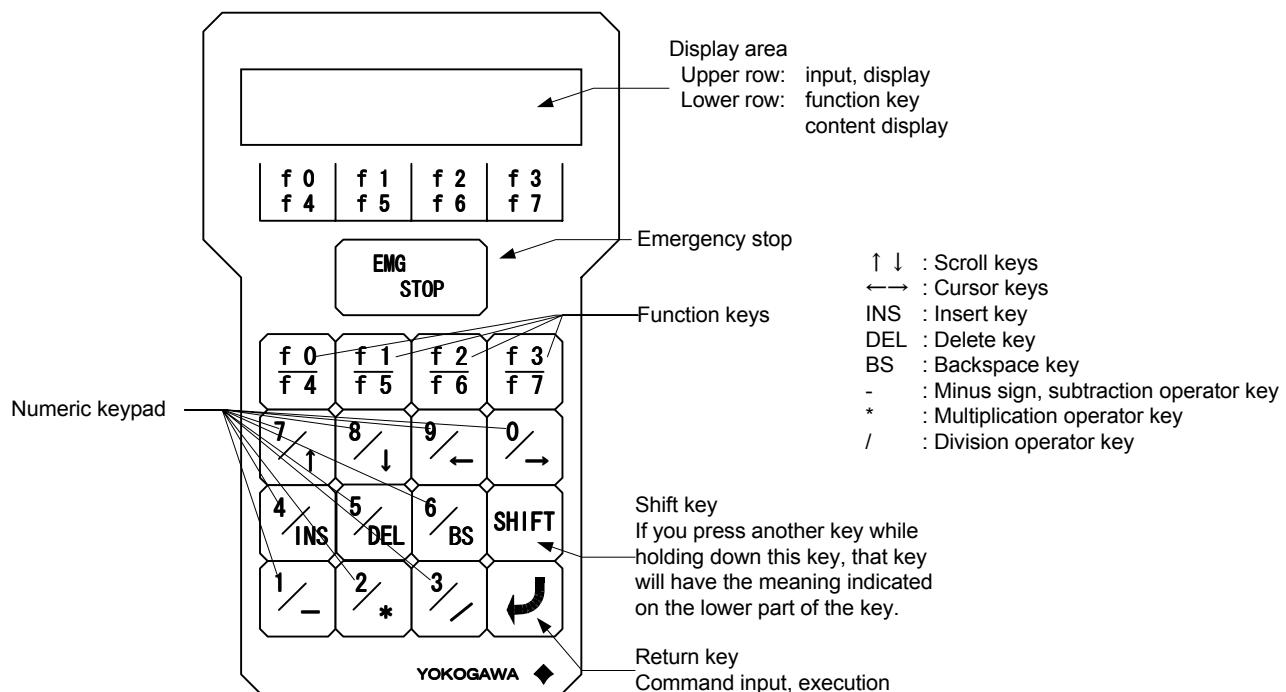
- **Special command display:**

In this display, you can issue common commands in a simple manner.

- **Program menu display:**

In this display, you can edit, copy, and delete programs.

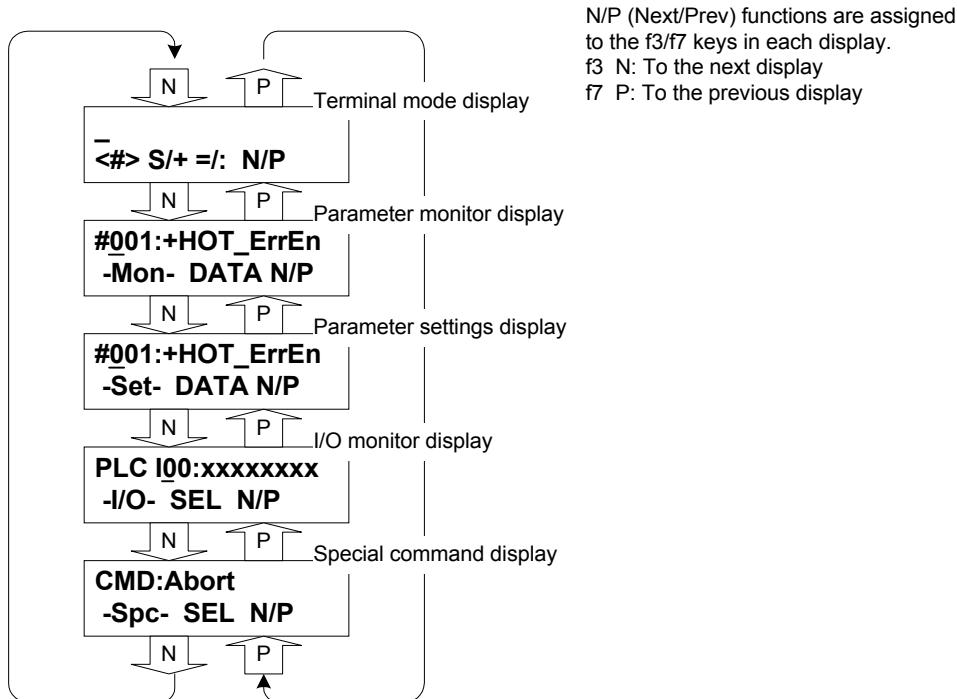
9.2 Features and Part Names



9.3 Switching Displays

Each display shifts in the order shown in the figure below. When the power is turned on and the operation display pendant is connected, the initial screen shows the terminal mode display.

Each display of the program menu display can be accessed by selecting edit (EDT), copy (CPY), or delete (DEL).



9 Operation Display Pendant

9.4 Terminal Mode Display

The terminal mode display allows you to send a character string entered from the keypad to the driver and display the response character string in the display.

In the example below, “#50” is input in display 2) and the response character string “R1D position bandwidth:12” is shown in display 3).

In the response character string display, the header part of a response character string (e.g., R00, ALM**, *) is not displayed. Even though the cursor is not displayed, hidden parts can be horizontally scrolled through and displayed by pressing the ← and → keys.

The cursor is displayed by pressing the input key (a key that allows character input when pressed), or the ↑ and ↓ keys. Once it is displayed, you can enter character strings.

1) Initial display

- <#> S/+ =/: N/P

2) During character string input

#50_ <#> S/+ =/: N/P

3) Displaying a response character string

**Position bandwidth: 12
<#> S/+ =/: N/P**

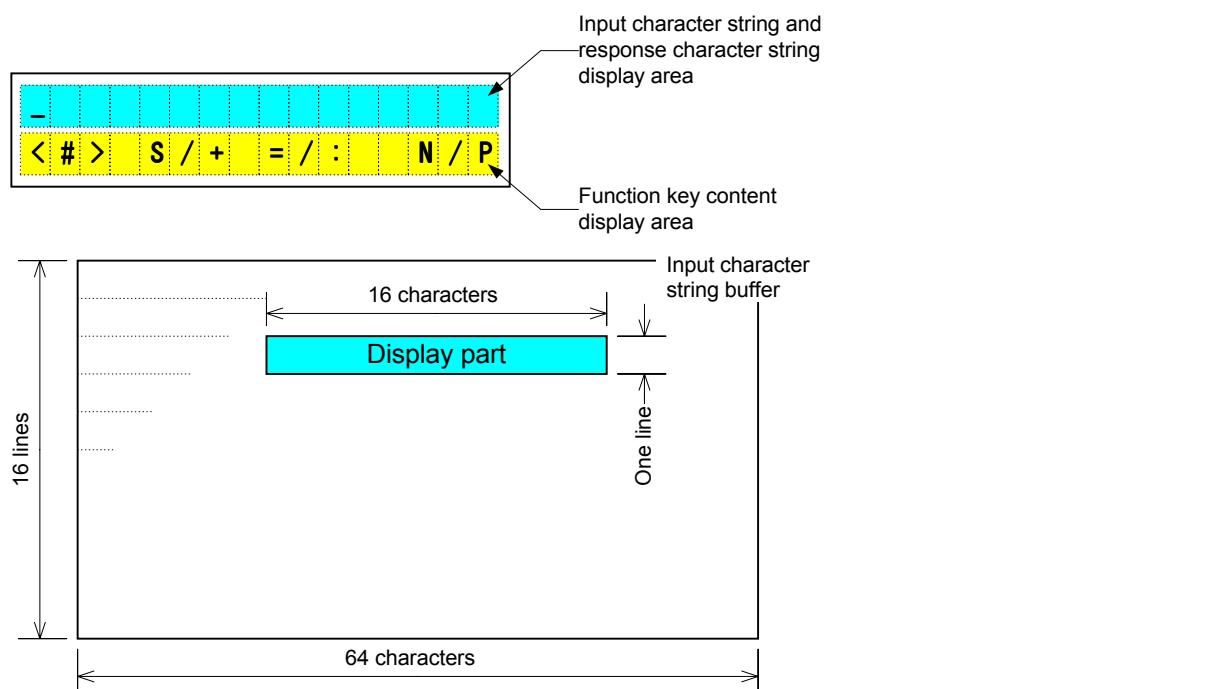
Characters in < >:

#, @, %, G, X,
F, f, A, a, M, P, +

f0 < >:	Character selection (positive direction) The character in < > changes at every key press.
f1 S:	Inputs the selected character.
f2 =:	The character in < > is input by pressing this key. Inputs =.
f3 N:	To the next display
f4 < >:	Character selection (opposite direction) The character in < > changes at every key press.
f5 +:	Inputs +.
f6:	Inputs :.
f7 P:	To the previous display

0 to 9: -, *, /	Each character is input.
--------------------	--------------------------

INS key:	Shifts the character string one character after the cursor position and insert a space at the cursor position.
DEL key:	Deletes the character immediately before the cursor. The cursor does not move the position.
BS key:	Deletes the character immediately before the cursor and move the cursor to the position one character before.
Return key:	Sends the entered character string to the controller.
← and → keys:	Moves the cursor on the input character string to the left or right.
↑ and ↓ keys:	Moves up and down in the input character string buffer.



9.5 Parameter Monitor Display

The current values of parameters/monitors with the numbers input from the keypad are displayed periodically. It is not necessary to press the Return in order to set a number.

In the previous example of display 2), parameter number “50” is entered to display the prompt character string of that parameter/monitor. When the f2 DATA key is pressed here, display 3) appears and displays the current value of the parameter/monitor.

If a nonexistent number is entered, both the data and comment displays show the comment in display 4).

1) Initial display

#001:+HOT_ErrEn
-Mon- DATA N/P

Cursor

2) Displaying comment

#050: Position bandwidth
-Mon- DATA N/P

3) Displaying data

#050: 12
-Mon- CMNT N/P

4) Displaying comment (when a number does not exist)

#000:-----
-Mon- DATA N/P

(CMNT)

f2 DATA: Switches display; to the data display
CMNT: To the comment (prompt) display

f3 N: To the next display

f7 P: To the previous display

0 to 9: Each character is entered.

← and → keys: Moves the cursor on the parameter/monitor number to the left or right.

↑ and ↓ keys: Increases/decreases the numeric value of the digit indicated with the cursor.

Parameter/monitor number setting area

0 0 1 : + H O T _ E r r E n
- M o n - D A T A N / P

Data display area
Comment display area

Function key content display area

9 Operation Display Pendant

9.6 Parameter Settings Display

This display is for changing the values of parameters.

When you input a parameter number from the keypad, the display shows a prompt for the parameter when comments are being displayed, and the current value of the parameter when data is being displayed.

When data is being displayed, it is possible to move the cursor to the data setting area using the \leftarrow and \rightarrow keys. In the data setting area (sign part), it is possible to reverse the sign by pressing the $-$ key. In the data setting area (absolute value part), the setting value can be set using the numeric keys as well as the \uparrow and \downarrow keys. When you press the Return key, the entered data is set as the parameter value of the parameter number (the Return key is accepted only when data is being displayed).

When the data is set, the setting result is displayed. If it is set normally, the display shows “OK!” If it failed to set, the display shows “NG! [ERROR ALARM CODE]”. When you press the f2 DATA key, the display switches to the data display; when you press the numeric keys or the ↑ and ↓ keys, it switches to the comment display. In the previous example of display 2), the parameter number “50” is entered to display the prompt character string of that parameter/monitor. If the f2 DATA key is pressed here, display 3) appears and displays the current value of the parameter/monitor. Display 4) shows the status in which the cursor is moved and data is input from the keypad. When the Return key is pressed here, the setting result is displayed as in display 5).

If a nonexistent number is entered, both the data and comment displays show the comment in display 6). In addition, if you input a parameter that exists but cannot be written to, the data display (but not the comment display) changes similarly to display 6).

- 1) Initial display
#001:+HOT_ErrEn
-Set- DATA N/P

Cursor

2) Displaying comment
#050: Position bandwidth
-Set- DATA N/P

3) Displaying data
#050: 0000000012
-Set- CMNT N/P

4) Setting data
#050:-0000000018
-Set- CMNT N/P

5) Displaying setting result
#050:NG![ALM62.0
-Set- DATA N/P

6) Displaying comment (when a number does not exist)
#000:-----
-Set- DATA N/P

(CMNT)

f2 DATA:
CMNT:
f3 N:
f7 P:

Switches display; to the data display
To the comment (prompt) display
To the next display
To the previous display

0 to 9:
-:
Return key:
← and → key:
↑ and ↓ key:

Each character is entered.
The sign of the data value is reversed if pressed while the cursor is at the data setting area (sign part).
Sets the input data to the driver.
Moves the cursor in the parameter number setting area and data setting area (absolute value part) to the left or right.
Increases/decreases the numeric value of the digit indicated by the cursor.

The diagram illustrates the internal structure of the display for different modes. It shows two main sections: the top section displays the parameter number and comment areas, while the bottom section displays the parameter number and data setting area (sign and absolute value) areas. Arrows point from labels to specific parts of the display, such as 'Parameter number setting area', 'Comment display area', 'Function key content display area', 'Data setting area (sign part)', and 'Data setting area (absolute value part)'.

9.7 I/O Monitor Display

The I/O signal status of the blocks with numbers input from the keypad for the selected I/O type is displayed periodically. It is not necessary to press the Return key in order to set a number.

There are three types of I/O that can be selected: "Ctl I," "Ctl 0," and "Drv I." You can switch among them by pressing the f2/f6 SEL key.

In the previous example of display 2), block number "1" is entered to display the signal status of Ctl DI block 1. If the f2/f6 SEL key is pressed here, the display changes similarly to display 3) and switches to the Ctl DO display.

1) Initial display

**Ctl I00:xxxxxxxx
-I/O- SEL N/P**

Cursor

2) Displaying Ctl DI

**Ctl I01:xxxxxxxx
-I/O- SEL N/P**

3) Displaying Ctl DO

**Ctl 000:xxxxxxxx
-I/O- SEL N/P**

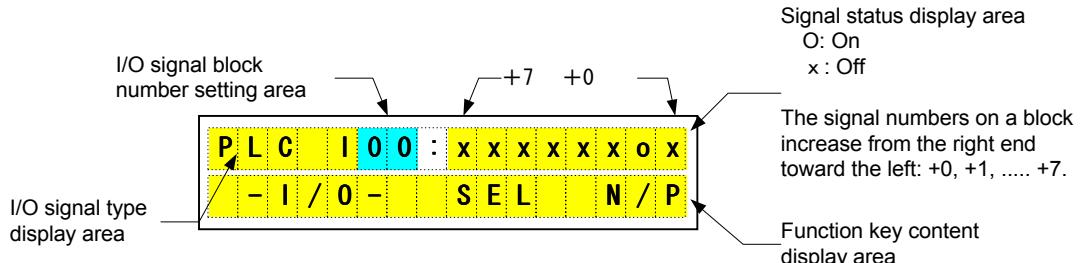
f2 SEL: Switches I/O signal type (positive direction).
f3 N: To the next display
f6 SEL: Switches I/O signal type (opposite direction).
f7 P: To the previous display

0 to 9: Each character is entered.
← and → key: Moves the cursor in the I/O signal block number setting area to the left or right.
↑ and ↓ key: Increases/decreases the numeric value of the digit indicated by the cursor.

Ctl I
Block number 0: DI07 to DI00
1: DI15 to DI08

Ctl 0
Block number 0: DO07 to DO00
1: DO15 to DO08

Drv I (Driver input signal status)
Block number 0: DI07 to DI00
1: DI15 to DI08



Driver input signal status

DI00: (Reserved)

DI01: (Reserved)

DI02: (Reserved)

DI03: (Reserved)

DI04: Homing detection

DI05: (+) direction over-travel detection

DI06: (-) direction over-travel detection

DI07: (Reserved)

DI08: (Reserved)

DI09: (Reserved)

DI10: (Reserved)

DI11: (Reserved)

DI12: (Reserved)

DI13: (Reserved)

DI14: (Reserved)

DI15: (Reserved)

9 Operation Display Pendant

9.8 Special Command Display

In this display, you can transmit selected commands to the controller.

The selection of the commands you can choose from depends on the main operation mode. They can be switched by pressing the f2/f6 SEL key.

When you select a command from the list and press the Return key, it is transmitted to the controller and the result of the command is shown in the display. By pressing the f2/f6 SEL key, it is switched to the command content display.

In the previous example of display 2), command “toMode15” is selected. When you press the Return key, this command is transmitted to the controller and the result of the command is displayed in display 3).

Command	Display
Abort	CMD:Abort
Error reset	CMD:RstErr
Servo ON	CMD:SrvOn
Servo OFF	CMD:SrvOff
Mechanical setting operation start	CMD:toMode15
Software driver reset	CMD:RstDrive
Motor type request	CMD:MotorType
ROM version request	CMD:ROM Version
Error status request/refresh	CMD:RefErrSts

1) Initial display

CMD:Abort
-Spc- SEL N/P

f2 SEL: Switches command (positive).
f3 N: To the next display
f6 SEL: Switches command (opposite).
f7 P: To the previous display

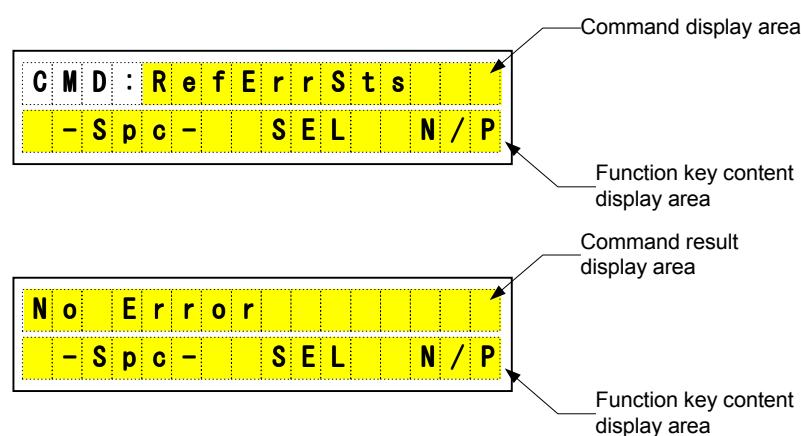
2) Displaying command

Return key: Transmits the selected command to the driver.

CMD:toMode15
-Spc- SEL N/P

3) Displaying command result

Mode15 Exec!
-Spc- SEL N/P



Chapter 10

Maintenance and Inspection

- 10.1 Maintenance and Inspection of the Motor Part
- 10.2 Maintenance and Inspection of the Driver Part
- 10.3 Replacing the Battery for Memory Backup
- 10.4 Backup and Restore Operations of Driver Memory Contents
 - 10.4.1 Backup Operation
 - 10.4.2 Restore Operation
- 10.5 Motor Problems and Corrective Actions

10 Maintenance and Inspection

10.1 Maintenance and Inspection of the Motor Part

Simple daily checks need to be performed on the motor part. Check the motor for excessive noise or abnormal vibration.

Do not dismount the motor.

If the motor operates abnormally after 20,000 hours of operation or five years since installation, depending on the environment and conditions used, replace the motor, and the servo driver if necessary.

10.2 Maintenance and Inspection of the Driver Part

There is no need for a daily maintenance and inspection of the driver part. However, it is prudent to clean the driver unit periodically to protect it from dust or particles since they may damage insulation.

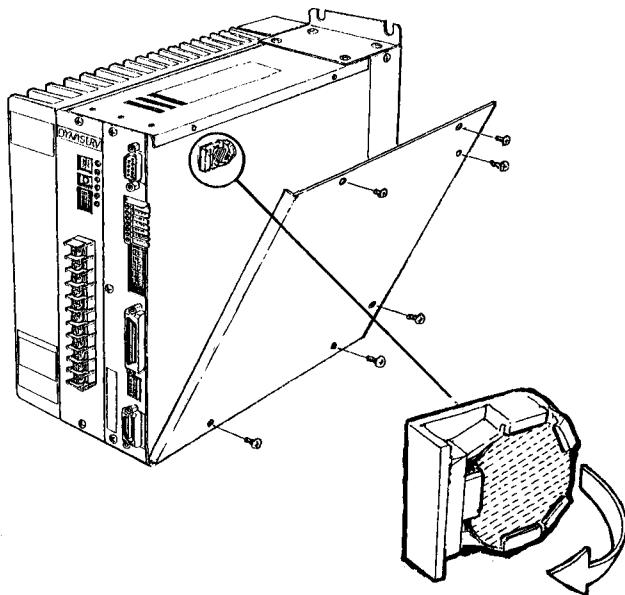
10.3 Replacing the Battery for Memory Backup

A lithium battery is provided inside the driver in order to store parameter data in memory. The life span of the lithium battery is normally 20,000 hours.

When the battery reaches the end of its life, an alarm signal will be displayed. When this happens, replace the battery as soon as possible.

The following describes the procedure used to replace the battery:

- 1) Back up parameters, programs, cam data and other important data stored in memory to flash ROM before replacing the battery. (For details on memory backup, see Section 10.4.)
- 2) Turn OFF the power.
- 3) Remove the six screws located on the side panel of the driver. (See the figure below.)



- 4) Replace the battery quickly (within 10 seconds).
- 5) Check the connection and turn ON the power. If no error is displayed, the battery has been replaced correctly.

Note 1: If a battery error is displayed, it is necessary to reset the system after replacing the battery. In this case, parameters and other data must be set again.

Note 2: Be sure to use <CR2032> 3V or equivalent battery. Be careful on the front and back orientation of the battery.

10.4 Backup and Restore Operations of Driver Memory Contents

Be sure to back up the driver memory contents in case of the occurrence of problems. If a problem occurs in the driver memory contents, it may become necessary to initialize (all reset) the driver to the same settings at the time of shipment from the factory. If the driver memory contents have been backed up in such a case, the driver memory contents can easily be restored to the factory settings.

10.4.1 Backup Operation

It is recommended to back up the driver memory contents to a file using the PC utility as well as to back up the driver memory contents to the driver's built-in flash ROM.

[Backup to a file using the PC utility]

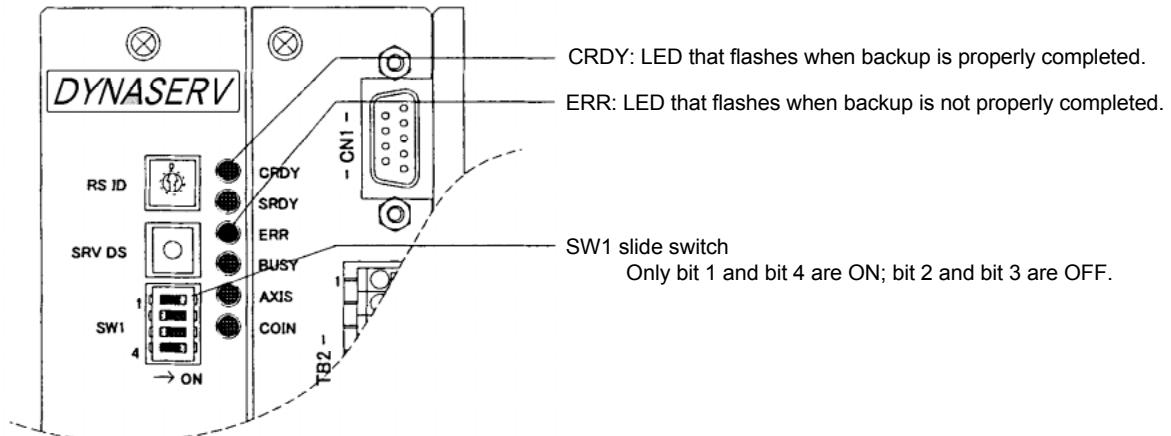
Using the PC utility, back up the driver memory contents to an electronic file in the personal computer. Perform the following backup operation using the PC utility:

- Parameters upload
- Programs upload (batch)
- Index equal division compensation upload (batch)
- Index unequal division upload (batch)
- Parts upload (batch)
- I/O settings upload

[Backup to the driver's built-in flash ROM]

Back up the driver memory contents to the on-board flash ROM by copying the driver memory contents to the driver's built-in flash ROM in a batch operation.

Set the slide switch on the front panel as shown in the figure below, and turn ON the power. When the CRDY lamp flashes after several seconds, the backup operation is completed.



10 Maintenance and Inspection

10.4.2 Restore Operation

The restore operation uses either of the backup data that was copied to a file via the PC utility or that was copied to the driver's built-in flash ROM. Perform either of the following restore operations:

[Restore using the PC utility]

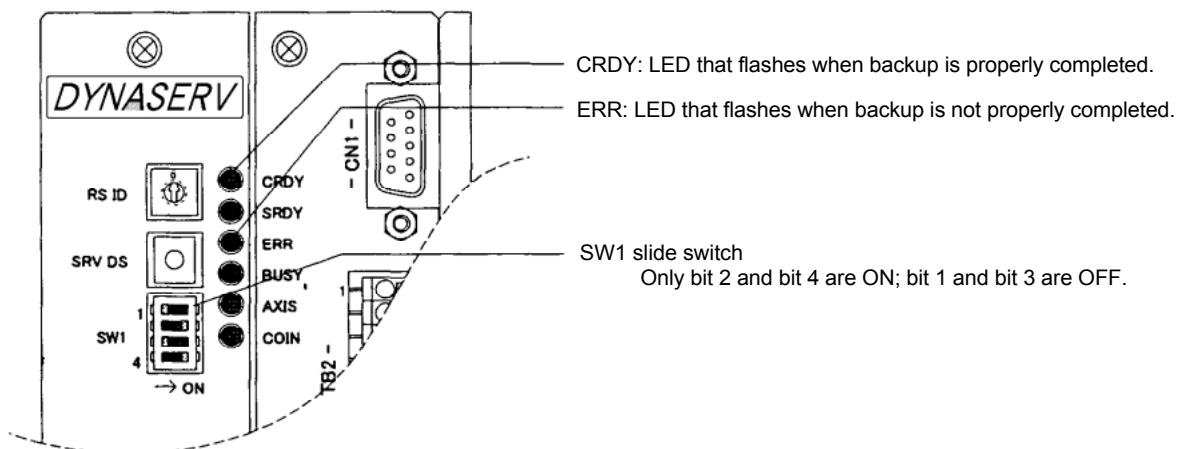
Using the PC utility, restore the backed up driver memory contents to an electronic file in the personal computer to the driver. Perform the following restore operation using the PC utility:

- Parameters download
- Programs download (batch)
- Index equal division compensation download (batch)
- Index unequal division download (batch)
- Parts download (batch)
- I/O settings download

[Restore from the driver's built-in flash ROM]

Restore the driver memory contents from the on-board flash ROM by copying the driver memory contents to the driver's built-in flash ROM in a batch operation.

Set the slide switch on the front panel as shown in the figure below, and turn ON the power. When the CRDY lamp flashes after several seconds, the restore operation is completed.



10.5 Motor Problems and Corrective Actions

When an abnormality occurs during motor operation, first check the LED display as well as the error display LED (7 segments) on the front panel of the driver.

If the cause of the problem cannot be determined by the indication of the LED display, take an appropriate corrective action as provided below.

If the driver is still not be able to return to a normal operating condition despite corrective actions taken, stop operating the drive and contact us.

Problem	Possible cause	Item(s) to be inspected	Corrective action
The motor does not servo-lock.	◆ No AC power is being supplied.	Check the wiring.	Turn on the power.
	◆ The servo ON terminal is set to H.	Inspect.	Set to L.
	◆ The Servo ON disable (SRVDS) button is being pressed.	Inspect.	Release the button.
	◆ Position control bandwidth, velocity control bandwidth, and/or position integral limiting value are too small.	Inspect.	Adjust to the proper value(s) or perform auto-tuning.
The motor does not start.	◆ Motor is overloaded.	Check to see if the motor operates without any load.	Reduce the load or replace a motor with higher torque if the motor starts.
	◆ Incorrect external wiring	Inspect the wiring.	Refer to the connection diagram and connect correctly.
	◆ Position control bandwidth, velocity control bandwidth, and/or position integral limiting value are too small.	Inspect.	Adjust to the proper value(s) or perform auto-tuning.
The motor rotation is unstable.	◆ Improper connections	Check the motor connections in phases A, B, C, and GND.	Refer to the connection diagram and connect correctly.
	◆ Incorrect motor/driver model combination	Check the model numbers on the rating nameplates.	If the combination is incorrect, change to the correct combination.
The motor overheats.	◆ Ambient temperature is too high.	Check if the ambient temperature is above 45°C.	Lower the ambient temperature to 45°C or less.
	◆ Motor is overloaded.	Check to see if the motor operates without any load.	Reduce the load or replace a motor with higher torque if the motor starts.
Abnormal sounds are generated.	◆ Improper mounting	Mounting screws are loosened.	Tighten the screws.
	◆ Bearing problem	Check for abnormal sound and vibration from the bearings.	Motor replacement is necessary. (Contact us.)
	◆ Mounting base vibration	Check the mounting base.	Reinforce the mounting base.
Motor torque is too small.	◆ Incorrect motor/driver model combination	Check the model numbers on rating nameplates.	If the combination is incorrect, change it to the correct combination.
	◆ Motor is overloaded.	Check the OVL error signal.	Review the operation. Reduce the load.
	◆ Position control bandwidth, velocity control bandwidth, and/or position integral limiting value are too small.	Inspect.	Adjust to the proper value(s) or perform auto-tuning.
Motor runs out of control.	◆ Incorrect motor/driver model combination	Check the model numbers on rating nameplates.	If the combination is incorrect, change it to the correct combination.
	◆ Improper connections	Check the motor/encoder connections	Refer to the connection diagram and connect correctly.

Chapter 11

Specifications

- 11.1 Standard Specifications
- 11.2 Torque - Speed Characteristics
- 11.3 External Dimensions (Unit: mm)
- 11.4 Restrictive Conditions for the Frequency of
Repeated Operations (DR5000B Series Only)

11 Specifications

11.1 Standard Specifications

(1) DM Series Motor

Item		Unit	A Series					
			DM1200A 00*1	DM1150A 00*1	DM1100A 00*1	DM1050A 00*1		
Motor + driver	Maximum output torque	N·m (kgf·m)	200 (20)	150 (15)	100 (10)	50 (5.0)		
	Rated number of revolutions (100/200V)	rps	0.5/1.0		1.0/1.0			
	Rotational positioning	Encoder resolution	p/rev	4,096,000				
		Repeatability accuracy	Sec	± 1				
Motor	Absolute accuracy	Sec	± 15					
	Rotor inertia	kg·m ²	167×10^{-3}	142×10^{-3}	119×10^{-3}	96×10^{-3}		
	Allowable axial load	Positive	4×10^4 (4×10^3)					
			2×10^4 (2×10^3)					
	Allowable moment load	N·m (kgf·m)	400 (40)					
	Axial displacement rigidity	mm/N (mm/kgf)	2×10^{-6} (2×10^{-5})					
			3×10^{-6} (3×10^{-5})					
	Moment displacement rigidity	rad/ N·m (rad/kgf·m)	4×10^{-7} (4×10^{-6})					
Mass		kg	29	24	19	14.5		
Height (refer to dimension diagram)			188	163	138	113		

Item		Unit	B Series				
			DM1075B 00*1	DM1060B 00*1	DM1045B 00*1	DM1030B 00*1	DM1015B 00*1
Motor + driver	Maximum output torque	N·m (kgf·m)	75 (7.5)	60 (6.0)	45 (4.5)	30 (3.0)	15 (1.5)
	Rated number of revolutions (100/200V)	rps	1.0/2.0	1.0/1.5	1.0/2.0	1.5/2.0	2.0/2.0
	Rotational positioning	Encoder resolution	p/rev	2,621,440			
		Repeatability accuracy	Sec	± 1			
Motor	Absolute accuracy	Sec	± 15				
	Rotor inertia	kg·m ²	27×10^{-3}	23×10^{-3}	19×10^{-3}	15×10^{-3}	12×10^{-3}
	Allowable axial load	Positive	3×10^4 (3×10^3)				
			1×10^4 (1×10^3)				
	Allowable moment load	N·m (kgf·m)	200 (20)				
	Axial displacement rigidity	mm/N (mm/kgf)	2.5×10^{-6} (2.5×10^{-5})				
			3×10^{-6} (3×10^{-5})				
	Moment displacement rigidity	rad/ N·m (rad/kgf·m)	1×10^{-6} (1×10^{-5})				
Mass		kg	14	12	9.5	7.5	5.5
Height (refer to dimension diagram)			194	168	143	118	92.5

Motor model name	DM1004B0F-2□*1	DM1004C0F-2□*1
Maximum torque (N·m)	4	
Maximum number of revolutions (rps)	2.5	
Encoder resolution (p/rev)	2,621,440	
Absolute accuracy (sec)	Note	
Repeatability accuracy (sec)	±3	
Axial rotational deflection (μm) _{p-p}	10	
Radial rotational deflection (μm) _{p-p}	10	
Rotor inertia ($\text{kg}\cdot\text{m}^2$)	5.5×10^{-3}	2.5×10^{-3}
Withstand load (N)	50	
Mass (kg)	3	3

Note: □: A/Absolute accuracy ±20 sec, B/Absolute accuracy ±60 sec

11 Specifications

(2) DR Series Motor

Item		Unit	A Series											
			DR1400 A00*1	DR1300 A00*1	DR1200 A00*1	DR1150 A00*1	DR1100 A00*1	DR1050 A00*1						
Motor + driver	Maximum output torque	N·m (kgf·m)	400 (40)	300 (30)	200 (20)	150 (15)	100 (10)	50 (5.0)						
	Rated number of revolutions (100/200V)	rps	0.25/0.5		0.5/1.0		1.0/1.0	1.5/1.5						
	Rotational positioning	Encoder resolution	p/rev	1,638,400										
	Repeatability accuracy	Sec	± 3											
Absolute accuracy		Sec	± 30											
Motor	Rotor inertia	kg·m ²	400x10 ⁻³	340x10 ⁻³	285x10 ⁻³	230x10 ⁻³	200x10 ⁻³	180x10 ⁻³						
	Allowable axial load	Positive	N (kgf)	4×10^4 (4×10^3)										
		Negative		2×10^4 (2×10^3)										
	Allowable moment load	N·m (kgf·m)	400 (40)											
	Axial displacement rigidity	Positive	mm/N (mm/kgf)	2×10^{-6} (2×10^{-5})										
		Negative		3×10^{-6} (3×10^{-5})										
	Moment displacement rigidity	rad/ N·m (rad/kgf·m)	4×10^{-7} (4×10^{-6})											
	Mass	kg	65	55	45	36	31	26						
Height (refer to dimension diagram)		mm	358	304	250	212	185	158						

Item		Unit	B Series											
			DR1060 B00*1	DR1045 B00*1	DR1030 B00*1	DR1015 B00*1	DR1008 B00*1							
Motor + driver	Maximum output torque	N·m (kgf·m)	60 (6.0)	45 (4.5)	30 (3.0)	15 (1.5)	8 (0.8)							
	Rated number of revolutions (100/200V)	rps	1.0/1.5	1.0/2.0	1.5/2.0	2.0/2.0								
	Rotational positioning	Encoder resolution	p/rev	1,015,808										
	Repeatability accuracy	Sec	± 3											
Absolute accuracy		Sec	± 45											
Motor	Rotor inertia	kg·m ²	33 x 10 ⁻³	26 x 10 ⁻³	24 x 10 ⁻³	21 x 10 ⁻³	15 x 10 ⁻³							
	Allowable axial load	Positive	N (kgf)	3×10^4 (3×10^3)										
		Negative		1×10^4 (1×10^3)										
	Allowable moment load	N·m (kgf·m)	200 (20)											
	Axial displacement rigidity	Positive	mm/N (mm/kgf)	3×10^{-6} (3×10^{-5})										
		Negative		4×10^{-6} (4×10^{-5})										
	Moment displacement rigidity	rad/ N·m (rad/kgf·m)	2×10^{-6} (2×10^{-5})											
	Mass	kg	15.5	13.0	11.0	9.0	6.0							
Height (refer to dimension diagram)		mm	207	179	151	123	85							

Item		Unit	E Series							
			DR1250E 00*1	DR1220E 00*1	DR1160E 00*1	DR1130E 00*1	DR1100E 00*1			
Motor + driver	Maximum output torque	N·m (kgf·m)	250 (25)	220 (22)	160 (16)	130 (13)	100 (10)			
	Rated number of revolutions (100/200V)	rps	0.5/1.0			1.0/1.5				
	Rotational positioning	Encoder resolution	p/rev	1,228,800						
		Repeatability accuracy	Sec	± 3						
Motor	Absolute accuracy	Sec	± 45							
	Rotor inertia	kg·m ²	185×10^{-3}	170×10^{-3}	140×10^{-3}	125×10^{-3}	100×10^{-3}			
	Allowable axial load	Positive	$4 \times 10^4 (4 \times 10^3)$							
		Negative	$2 \times 10^4 (2 \times 10^3)$							
	Allowable moment load	N·m (kgf·m)	400 (40)							
	Axial displacement rigidity	Positive	$2 \times 10^6 (2 \times 10^5)$							
		Negative	$3 \times 10^6 (3 \times 10^5)$							
	Moment displacement rigidity	rad/ N·m (rad/kgf·m)	4×10^{-7} (4×10^{-6})							
	Mass	kg	48	44	36	32	26			
	Height (refer to dimension diagram)	mm	355	327	271	243	210			

Item		Unit	E Series	
			DR1070E 00*1	DR1030E 00*1
Motor + driver	Maximum output torque	N·m (kgf·m)	70 (7.0)	30 (3.0)
	Rated number of revolutions (100/200V)	rps	1.5/2.0	1.5/2.0
	Rotational positioning	Encoder resolution	1,228,800	
		Repeatability accuracy	Sec	± 3
Motor	Absolute accuracy	Sec	± 45	
	Rotor inertia	kg·m ²	85×10^{-3}	72×10^{-3}
	Allowable axial load	Positive	$4 \times 10^4 (4 \times 10^3)$	
		N (kgf)	$2 \times 10^4 (2 \times 10^3)$	
	Allowable moment load	N·m (kgf·m)	400 (40)	
	Axial displacement rigidity	Positive	$2 \times 10^6 (2 \times 10^5)$	
		Negative	$2 \times 10^6 (3 \times 10^5)$	
	Moment displacement rigidity	rad/ N·m (rad/kgf·m)	4×10^{-7} (4×10^{-6})	
	Mass	kg	22	18
	Height (refer to dimension diagram)	mm	183	156

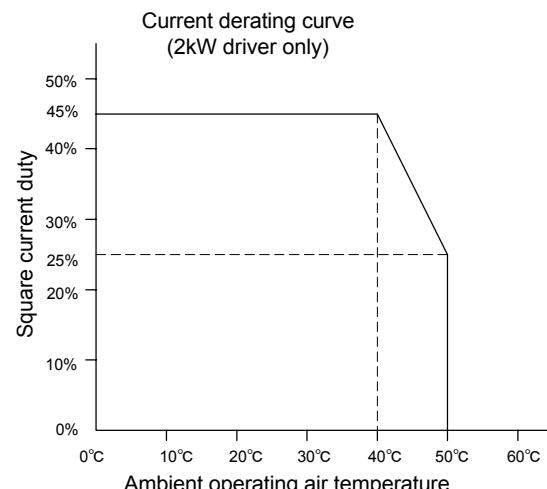
11 Specifications

(3) DR/5000 Series Motor

Item		Unit	5000 E Series		5000 B Series			
			DR5100E 00*1	DR5070E 00*1	DR5070B 00*1	DR5050B 00*1	DR5030B 00*1	
Motor + driver	Maximum output torque	N·m (kgf·m)	100 (10)	70 (7.0)	70 (7.0)	50 (5.0)	30 (3.0)	
	Rated number of revolutions (100/200V)	rps	/2.0		/4.0			
	Rotational positioning	Encoder resolution	638,976		557.056			
		Repeatability accuracy	Sec	± 4		± 5		
	Absolute accuracy	Sec	± 90		± 90			
Motor	Rotor inertia	kg·m ²	125 $\times 10^{-3}$	100 $\times 10^{-3}$	37 $\times 10^{-3}$	34 $\times 10^{-3}$	27 $\times 10^{-3}$	
	Allowable axial load	Positive	4 $\times 10^4$ (4 $\times 10^3$)		3 $\times 10^4$ (3 $\times 10^3$)			
		N (kgf)	2 $\times 10^4$ (2 $\times 10^3$)		1 $\times 10^4$ (1 $\times 10^3$)			
	Allowable moment load	N·m (kgf·m)	400 (40)		200 (20)			
	Axial displacement rigidity	Positive	mm/N (mm/kgf)	2 $\times 10^{-6}$ (2 $\times 10^{-5}$)	3 $\times 10^{-6}$ (3 $\times 10^{-5}$)			
		Negative	3 $\times 10^{-6}$ (3 $\times 10^{-5}$)		4 $\times 10^{-6}$ (4 $\times 10^{-5}$)			
	Moment displacement rigidity	rad/ N·m (rad/kgf·m)	4 $\times 10^{-7}$ (4 $\times 10^{-6}$)		2 $\times 10^{-6}$ (2 $\times 10^{-5}$)			
Mass		kg	32	26	18.0	16.0	13.5	
Height (refer to dimension diagram)			mm	243	210	240	212	184

(4) Motor Environment Specification

	Motor	Comment
Ambient operating conditions	Temperature	0 to 45°C
	Humidity	20 to 85% R.H Should have no condensation.
Ambient storage conditions	Temperature	-20 to 85°C
	Humidity	20 to 85% R.H Should have no condensation.
Operating environment	No corrosive gases and dust should be present.	



(5) Driver Part (General Specifications)

Type	500W type		2kW type							
Model name	U□□□□□□□A□-*□□_		U□□□□□□□K□-*□□_		U□□□□□□□L□-*□□_					
Input power supply voltage	100 to 115V AC + 10%, -15% 50Hz/60Hz	200 to 230V AC + 10%, -15% 50Hz/60Hz	100 to 115V AC + 10%, -15% 50Hz/60Hz	200 to 230V AC + 10%, -15% 50Hz/60Hz	100 to 115V AC + 10%, -15% 50Hz/60Hz	200 to 230V AC + 10%, -15% 50Hz/60Hz				
Maximum current consumption (KVA)	0.8		3.4		3.4					
Ambient operating air temperature and humidity	0 to 50°C, 20 to 90% RH, without condensation									
Ambient storage air temperature and humidity	-20 to 85°C, 20 to 90% RH, without condensation									
Operating environment	No corrosive gases and dust should be present.									
Mass (kg)	1.7		3.6		3.2					

* Input voltage 100 to 115V AC: 1, 200 to 230V AC: 2

Note: The 20A-type driver requires the derating as indicated in the figure above for the current square duty, depending on the ambient temperature during operation. (For motors of DM1000A series, DR1000A series, DR1000E series, and DR5000E series)

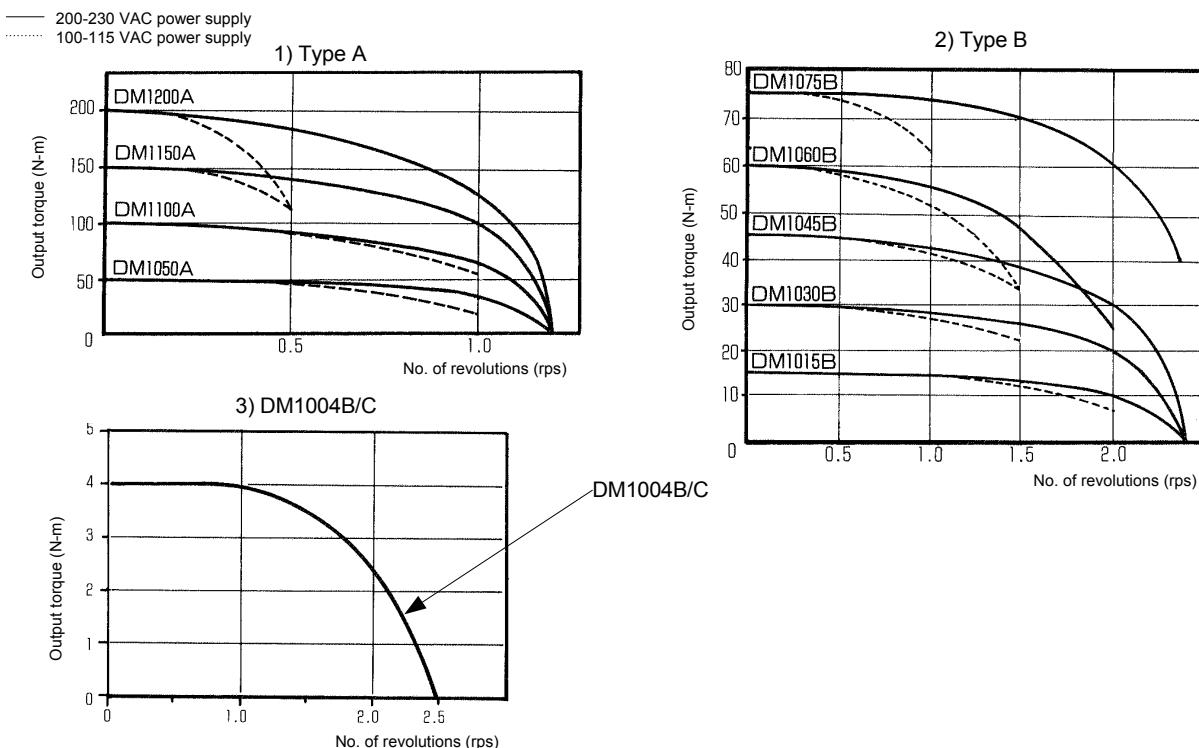
(6) Driver Function Specifications

Item	Specifications																		
Higher interface	RS232C interface (single channel communication, multi-channel communication) Controller interface (pulse train position command)																		
Mechanical input signal	Homing signal, (+) direction hardware over-travel signal, (-) direction hardware over-travel signal, emergency stop input signal																		
Mechanical input signal	Brake signal (can be switched between clamp and dynamic brake applications with a parameter)																		
Encoder resolution (position command resolution when shipped)	Rotating type	DM1000A series ; 4096000 pls/rev (1024000 pls/rev) DM1000B series ; 2621000 pls/rev (655360 pls/rev) DM1004B/C ; 2621000 pls/rev (655360 pls/rev) DR1000A series ; 1638400 pls/rev (819200 pls/rev) DR1000B series ; 1015808 pls/rev (507904 pls/rev) DM1000E series ; 1228800 pls/rev (614400 pls/rev) DR5000B series ; 557056 plc/rev (278528 pls/rev) DR5000E series ; 638976 pls/rev (319488 pls/rev) stiffness series: 0.5 μm, LM1/2 ; 0.25 μm (0.25 μm) LM3/5 ; 0.5 μm (1.0 μm)																	
Control part	Method	I-PD position control (position: integral proportional control, velocity: proportional control) Various feed forward functions (position, velocity, acceleration) Various standard filters (velocity command filter, velocity feedback filter, first order delay filter) Optional filter (notch filter 2 channels)																	
	Adjustment	Position control bandwidth: 1 Hz to 32Hz, velocity control loop width: 5Hz to 200Hz Position integral limiter setting Various feed forward percentages (position, velocity, acceleration) Various standard filter settings (velocity command filter bandwidth, velocity feedback filter enable/disable, bandwidth, first order delay filter setting) Optional filter setting (notch filter bandwidth)																	
Acceleration/deceleration control	<ul style="list-style-type: none"> *1) Calculates proportional gain and acceleration feed forward gain of the velocity control part automatically based on measurement by the auto-tuning operation or manual setting of the load inertia/weight with respect to the settings of velocity control bandwidth and acceleration feed forward percentage. *2) Calculates position control bandwidth, velocity control loop bandwidth, and position integral limiting value automatically during execution of the auto-tuning operation or by manual setting of the servo stiffness *3) Real time override possible, interlock possible 																		
Operation function	Follows the position command from the controller interface when none of the operations listed below is being performed. <table border="1" style="margin-top: 10px; text-align: center;"> <thead> <tr> <th rowspan="2">Operation</th> <th colspan="2">Pulse train</th> </tr> <tr> <th>Controller interface</th> <th>RS232C interface</th> </tr> </thead> <tbody> <tr> <td>Homing operation</td> <td>○</td> <td>○</td> </tr> <tr> <td>Test operation</td> <td>○</td> <td>○</td> </tr> <tr> <td>Auto-tuning</td> <td>○</td> <td>○</td> </tr> <tr> <td>Jog move</td> <td>×</td> <td>○</td> </tr> </tbody> </table>		Operation	Pulse train		Controller interface	RS232C interface	Homing operation	○	○	Test operation	○	○	Auto-tuning	○	○	Jog move	×	○
Operation	Pulse train																		
	Controller interface	RS232C interface																	
Homing operation	○	○																	
Test operation	○	○																	
Auto-tuning	○	○																	
Jog move	×	○																	
Protection functions	Encoder/resolver error, power module error (over-voltage and over current), main power supply error, overload, maximum velocity, excessive position deviation, hardware over-travel, software over-travel (only for linear coordinate)																		
Others	Support software PC utility running under Windows (optional) Possible to connect the operation display pendant (optional)																		
Monitor	Analogue signal monitor (velocity, general, torque/thrust command) For general monitoring, what is shown by the monitor can be selected by setting (position error, test operation response, position command value, current position value, position command differential value) Digital signal monitor (settling signal) Monitoring internal information by higher interface Error and alarm display on a 7-segment LED																		

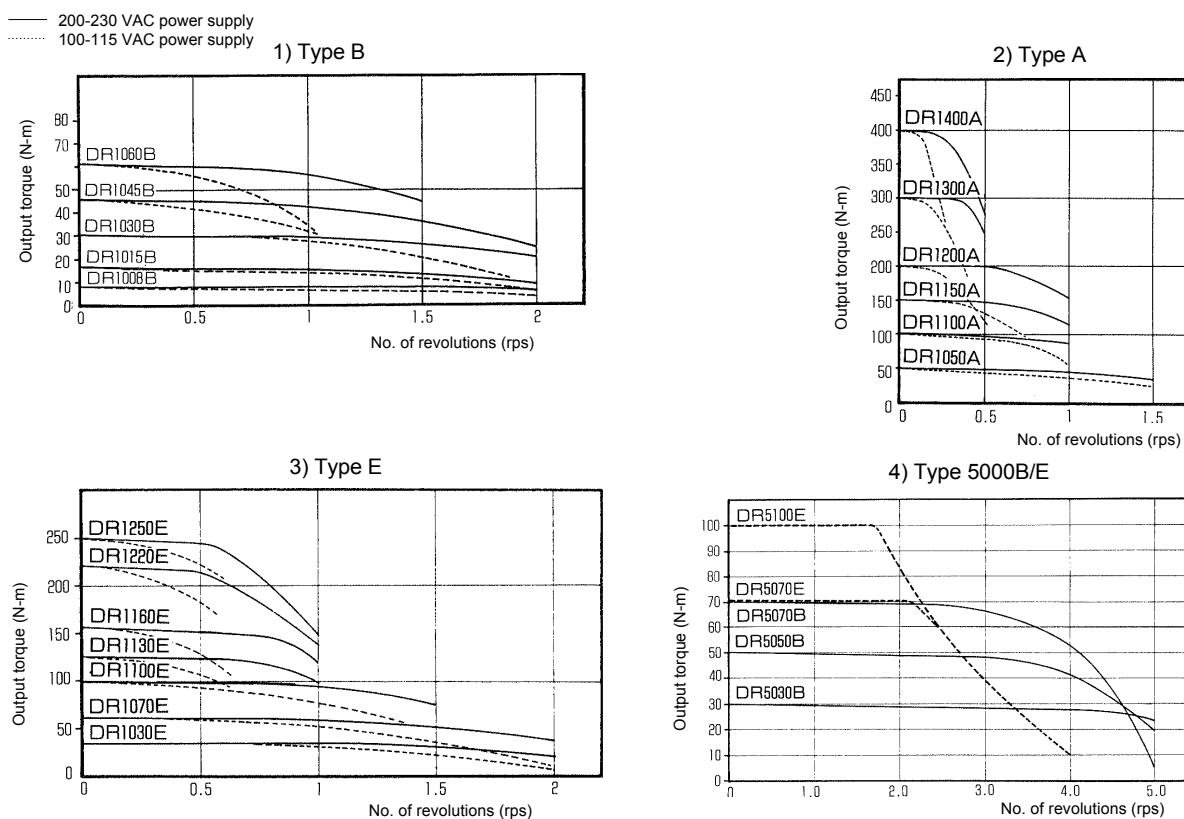
11 Specifications

11.2 Torque - Speed Characteristics

(1) DM Series



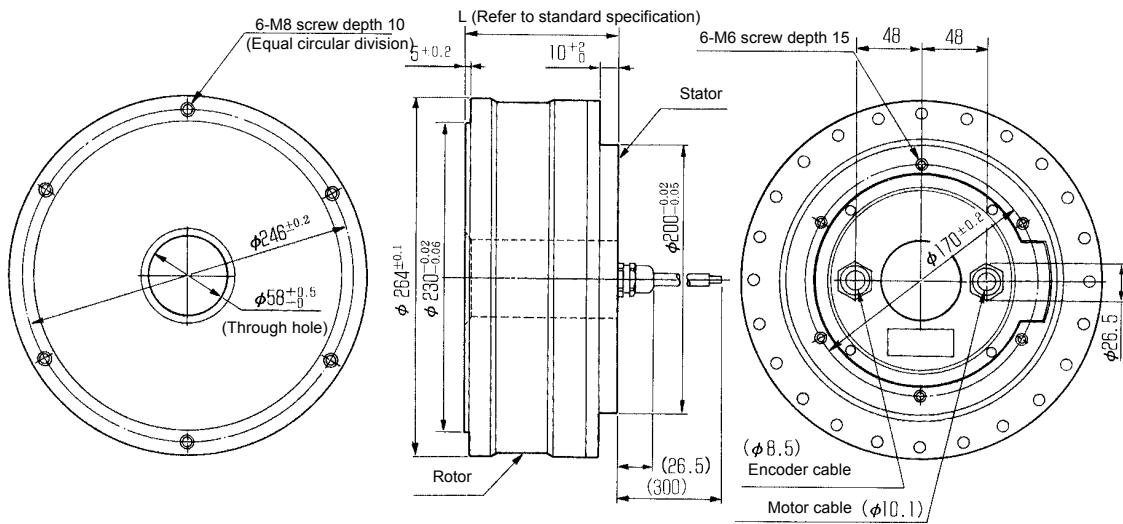
(2) DR Series



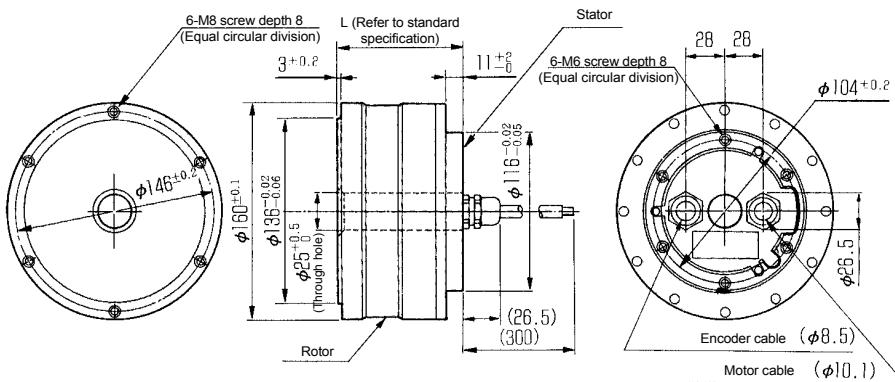
11.3 External Dimensions (Unit: mm)

(1) DM Series Motor

1) Type A

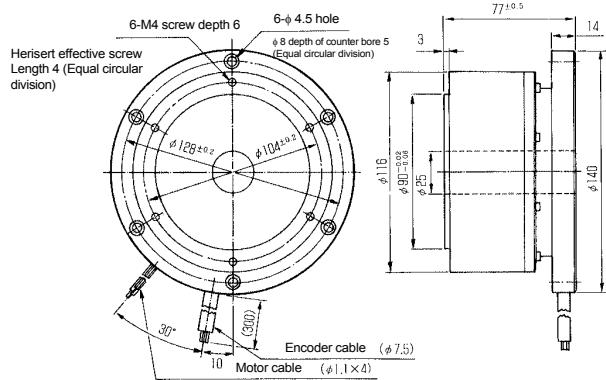


2) Type B

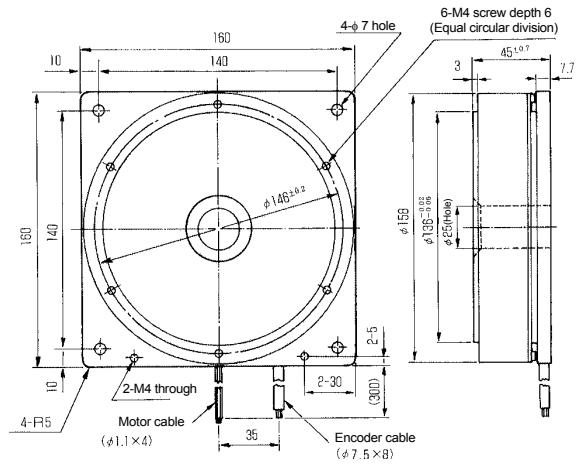


3) DM1004B/C

<DM1004C>



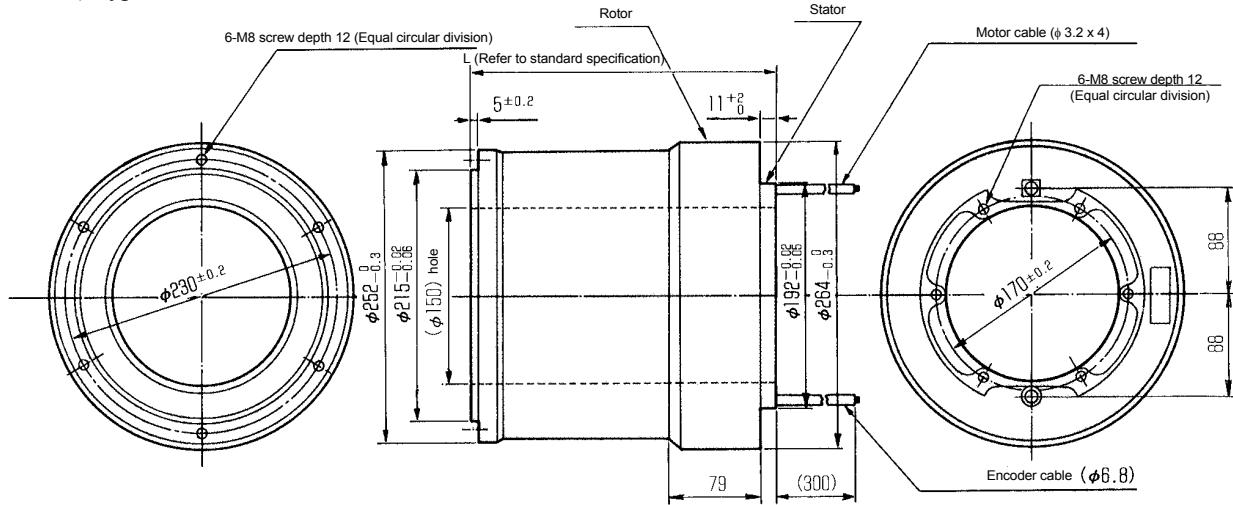
<DM1004B>



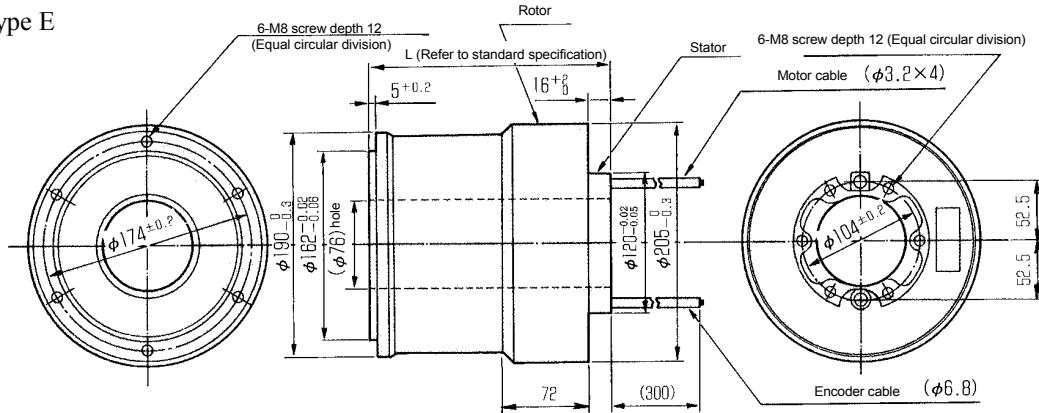
11 Specifications

(2) DR Series Motor

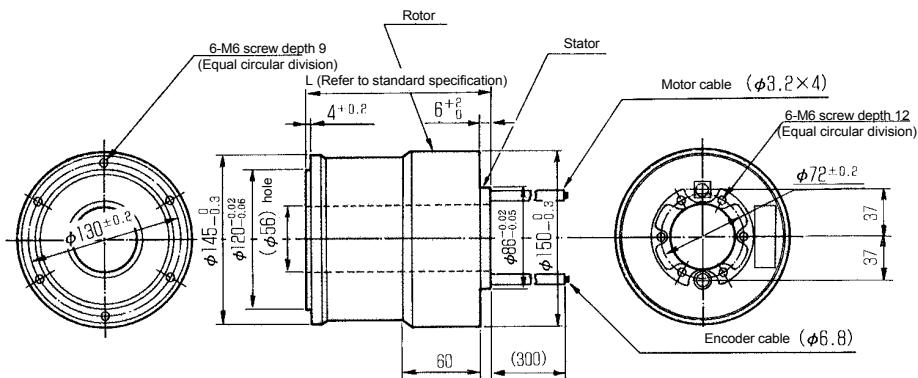
1) Type A



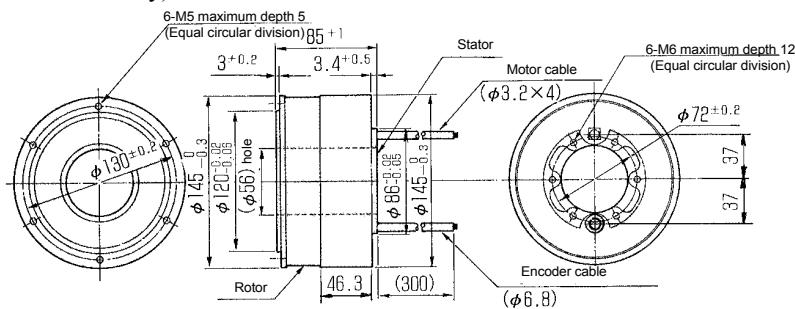
2) Type E



3) Type B



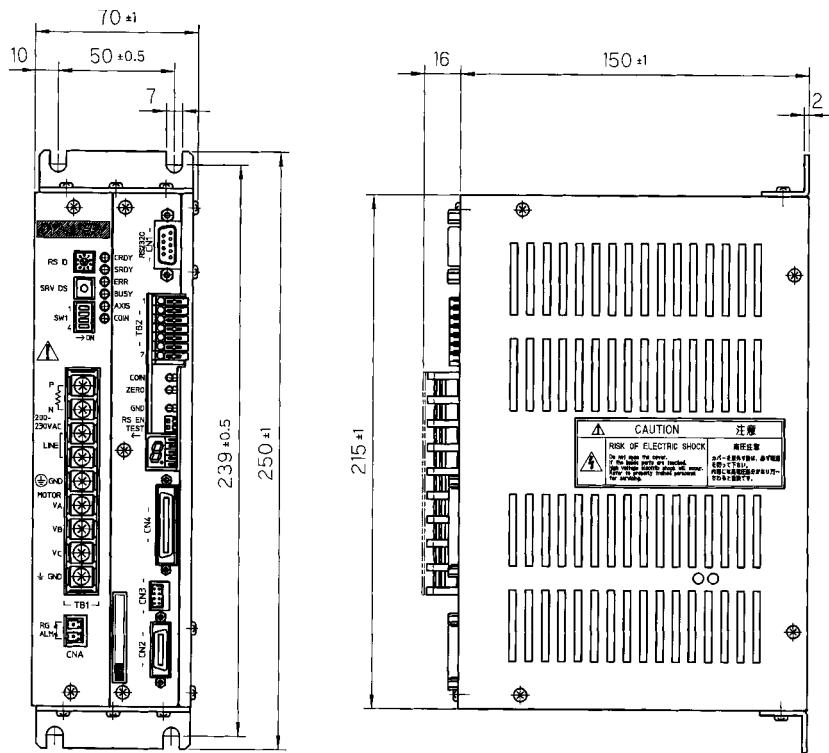
4) Type B (DR1008B only)



(3) Driver Section

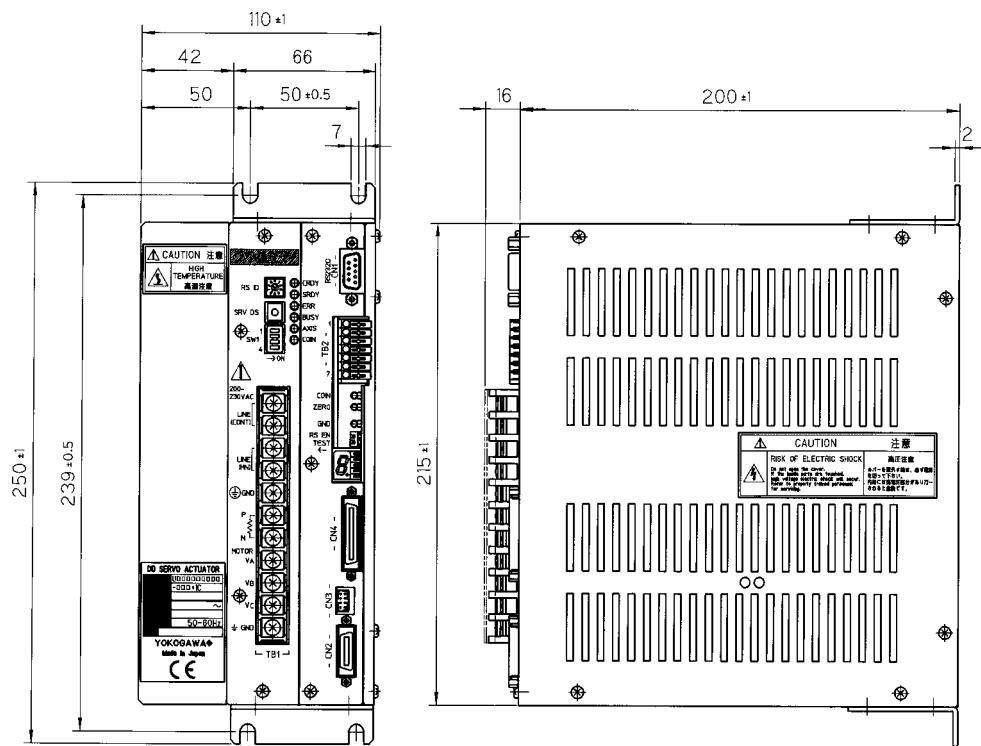
1) U□□□□□□□A/B

(500W, Type B is shown in the figure.)



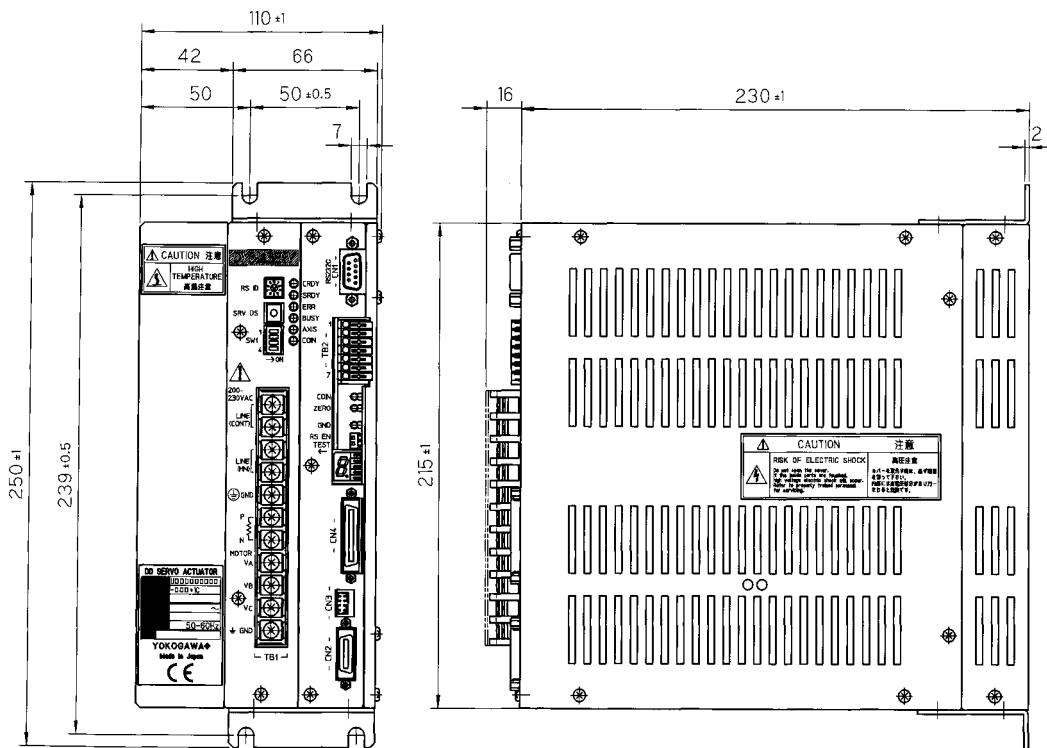
2) U□□□□□□□L

(2kW level without regenerative unit)



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3) U□□□□□□□K
(2kW level with regenerative unit)



11.4 Restrictive Conditions for the Frequency of Repeated Operations (DR5000B Series Only)

When running and stop operations are performed repeatedly on DYNASERV DR5000B series (DR5030B, 5050B, 5070B) because of a high number of rated revolution, some restrictions may apply based on the characteristic of the motor and the driver with respect to the frequency of repeated running and stop operations. Consider those restrictions carefully when using the motor.

(1) Restrictions on the motor

The operating conditions under which the motor rotates and stops repeatedly are set assuming that the motor is mounted on a metal stand, and the ambient temperature is 45°C.

When the motor is operated repeatedly with a cycle of acceleration, uniform speed, deceleration and stop, if the load conditions and the operation time are set as shown in Figure 11.1, it is necessary to satisfy the equations below.

In addition, if either the average speed (number of revolutions) or the current duty is known, the other can simply be obtained from the graph shown in Figure 11.2.

The motor, current and speed can actually be measured by the oscilloscope function (see Chapter 8) of the PC utility. Verify them with the monitor numbers listed below.

#365 Present velocity value
#369 Present current value (A/D)

$$\eta^B = \frac{N_R}{2} \cdot (t_1 + 2t_2 + t_3) \times \frac{1}{5t_{CY}} \times 100 \quad \text{Equation (1)}$$

$$\eta^C = (t_1 I_1^2 + t_2 I_2^2 + t_3 I_3^2) \times \frac{1}{5t_{CY}} \times 100 \quad \text{Equation (2)}$$

$$\eta^B + 2.6 \cdot \eta^C < 103 \quad \text{Equation (3)}$$

η^B = Velocity duty

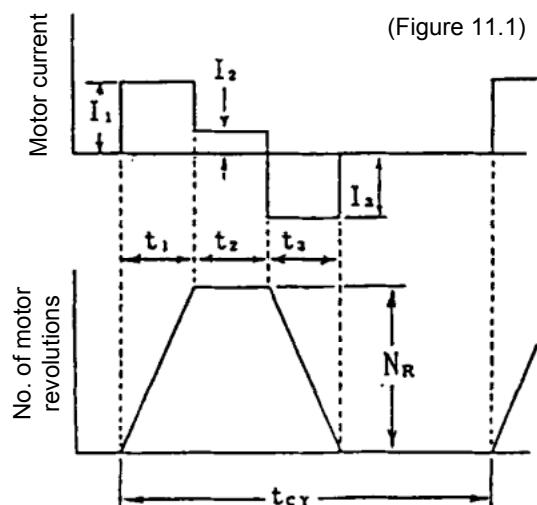
η^C = Current duty

I₁, I₂, I₃ = Current (A)

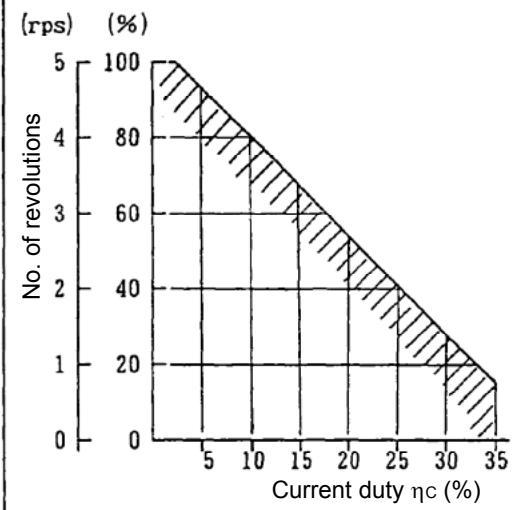
N_R = No. of revolutions (rps)

t_{CY} = Cycle time (msec)

t₁, t₂, t₃ = Time (msec)



(Figure 11.2) Average velocity/current duty simplified graph



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<Example>

$$NR = 4 \text{ (rps)}$$

$$I_1 = I_3 = 9 \text{ (A)}$$

$$I_2 = 3 \text{ (A)}$$

$$t_1 = t_2 = t_3 = 1/4t_{CY}$$

When calculating from the above setting example,

$$\begin{aligned}\eta^B &= \frac{4}{2} \left(\frac{1}{4}t_{CY} + \frac{2}{4}t_{CY} + \frac{1}{4}t_{CY} \right) \times \frac{1}{5t_{CY}} \times 100 \\ &= \frac{2}{5} \times 100 = 40\end{aligned}$$

$$\begin{aligned}\eta^C &= \left(\frac{81}{4}t_{CY} + \frac{9}{4}t_{CY} + \frac{81}{4}t_{CY} \right) \times \frac{1}{225t_{CY}} \times 100 \\ &= \frac{17100}{900} = 19\end{aligned}$$

When substituting the above into equation (3),

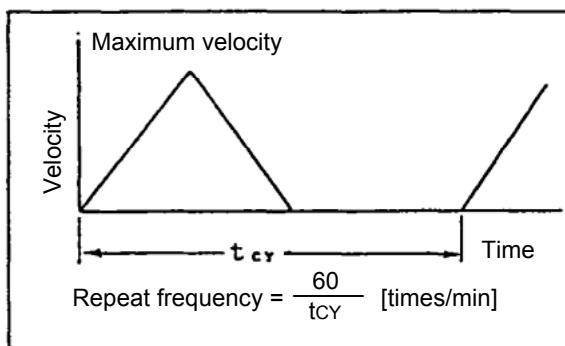
$$40 + 2.6 \times 19 = 98 < 103$$

Therefore, the result satisfies the equation, and the setting is deemed to be correct.

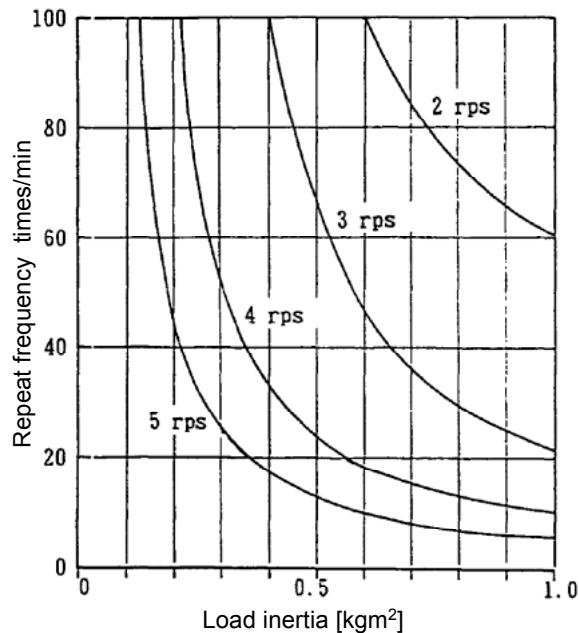
(2) Restrictions on the driver

The repeat frequency caused by the driver is restricted by the heat generation of the driver's built-in regenerative resistor. If a repeated operation is performed using the pattern as shown in Figure 11.3, the repeat frequency, as shown in Figure 11.4, is restricted by the load inertia using the number of revolutions as a parameter. If the load inertia exceeds 1 kgm^2 , or if it is necessary to use on DYNASERV DR5000B series (DR5030B, 5050B, 5070B) outside of the limits, please contact Compumotor's Applications Dept.

(Figure 11.3)



(Figure 11.4)



Parameter List		STD1				
Parameter No.	Parameter name	Minimum value	Maximum value	Initial value	Unit	Possible to change
1	Enables the over-travel error function in the + direction	0	1	0	None	Always
2	Enables the over-travel error function in the - direction	0	1	0	None	Always
4	Selecting the acceleration type	0	1	0	None	Always
5	Selecting the deceleration type	0	1	0	None	Always
7	Acceleration time during a trapezoidal move	1	9999	1000	msec	Always
8	Deceleration time during a trapezoidal move	1	9999	1000	msec	Always
9	Feeding Velocity	0	16000000	Motor dependent	Axis command unit/sec	Always
10	Jog Velocity	0	16000000	Motor dependent	Axis command unit/sec	Always
11	Over-travel search velocity during a homing move	1	16000000	Motor dependent	Axis command unit/sec	Always
12	Homing operation: Home sensor proximity signal search velocity	1	16000000	Motor dependent	Axis command unit/sec	Always
13	Homing operation: Home sensing feed velocity 1	0	16000000	Motor dependent	Axis command unit/sec	Always
15	Homing operation: Origin position offset move feed velocity	1	16000000	Motor dependent	Axis command unit/sec	Always
16	Velocity override percentage 1	0	20000	10000	1/100 %	Always
20	Homing direction	0	1	0	None	Always
21	Enable/disable the over-travel signal under the homing mode	0	1	0	None	Always
25	Homing operation: Origin inside selection	0	1	1	None	Always
27	Enabling the homing flag position error	0	1	1	None	Always
29	Offset distance from the Home position	-9999999	9999999	0	Axis command unit	Always
31	Operation width under testing mode	0	9999999	Motor dependent	Axis command unit	Always
32	Operation width under Auto-tuning	1	9999999	Motor dependent	Axis command unit	Always
33	Maximum acceleration/deceleration under Auto-tuning	100	9999	9999	msec	Always
34	Initializing the acceleration/deceleration time while under Auto-tuning	100	9999	1000	msec	Always
38	Servo stiffness settings	1	5	3	None pulse	Always
45	Position settling pulse width 2	0	32767	Motor dependent	pulse	Always
46	Position settling pulse width 3	0	32767	Motor dependent	pulse	Always
47	Position settling pulse width 4	0	32767	Motor dependent	pulse	Always
48	Position control bandwidth 2	1	32	1	Hz	Always
49	Velocity control bandwidth 2	5	200	20	Hz	Always

Parameter No.	Parameter name	Minimum value	Maximum value	Initial value	Unit	Possible to change
50	Position control bandwidth 1	1	32	1	Hz	Always
51	Velocity control bandwidth 1	5	200	20	Hz	Always
53	Position integral limiting value	0	4999999	10000	None	Always
54	Position feed forward percentage	0	126	90	%	Always
55	Velocity feed forward percentage	0	126	100	%	Always
56	Acceleration feed forward gain	0	200	0	%	Always
58	Position settling pulse width 1	0	32767	1	pulse	Always
59	Position current value filter frequency	1	200	10	Hz	Always
61	Position settling signal chattering processing count	1	100	1	None	Always
65	Value causing an error detection in the (+) or CW direction	1	999999	999999	pulse	Always
66	Value causing an error detection in the (-) or CCW direction	-999999	-1	-999999	pulse	Always
68	Torque limit percentage	0	10000	10000	1/100 %	Always
69	Axis velocity monitoring gain (digital monitor)	0	8	0	None	Always
70	Analog monitor selection	0	5	4	None	Always
71	Axis positioning error monitoring gain (analog monitor)	0	8	0	None	Always
72	Test operation monitoring gain (analog monitor)	0	8	0	None	Always
73	Position monitoring gain (analog monitor)	0	14	0	None	Always
74	Position differential value monitoring gain (analog monitor)	0	7	0	None	Always
75	Velocity monitor selection (digital monitor)	0	1	0	None	Always
89	Brake turn OFF delay time upon Servo ON	0	2000	0	msec	Always
90	Advanced Brake turn ON before Servo OFF	0	2000	0	msec	Always
91	TBX_EMG Servo status	0	2	0	None	Always
93	IFB_EMG Servo status	0	2	0	None	Always
94	Position command differential value excessive error processing type	0	5	1	None	Always
95	Over-travel error function in the + direction processing type	0	5	1	None	Always
96	Over-travel error function in the - direction processing type	0	5	1	None	Always
98	Emergency stopping deceleration time during a trapezoidal move	1	9999	1	msec	Always
106	Settling wait enable	0	1	0	None	Always

Parameter No.	Parameter name	Minimum value	Maximum value	Initial value	Unit	Possible to change
152	First order delay compensator setting	0	3	0	None	Always
153	Notch filter: Frequency 1 selection	50	1500	1500	Hz	Always
154	Notch filter: Frequency 2 selection	50	1500	1500	Hz	Always
155	Load inertial/load mass	0	200000	0	1/1000kgm ² or 1/1000kg	Always
201	Selection of English/Japanese display	0	1	0	None	While in machine setting mode
202	Coordinate (+) direction setting	0	1	1	None	While in machine setting mode
203	Using position current value filter	0	1	Motor dependent	None	While in machine setting mode
204	Command pulse type	0	2	2	None	While in machine setting mode
205	Monitor pulse type	0	1	1	None	While in machine setting mode
206	Enabling current limit external input	0	1	0	None	While in machine setting mode
207	Simplified scaling weighted data	1	64	4	None	While in machine setting mode
213	Maximum velocity	1	16000000	Motor dependent	Axis command unit/sec	While in machine setting mode
218	Enables error when over-load occurs	0	1	1	None	While in machine setting mode
219	Velocity feedback filter use	0	1	0	None	While in machine setting mode
220	Velocity feedback filter bandwidth	50	1000	1000	Hz	While in machine setting mode
221	Velocity command filter bandwidth	50	1000	1000	Hz	While in machine setting mode
222	Enables error when over-speed occurs	0	1	1	None	While in machine setting mode
224	Enables error when excessive position deviation occurs	0	1	1	None	While in machine setting mode
227	Over-speed error processing type	0	2	1	None	While in machine setting mode
228	Over-load error processing type	0	2	1	None	While in machine setting mode
229	Excessive position deviation error processing type	0	2	1	None	While in machine setting mode

Parameter details		STD1
1	Enables the over-travel error function in the + direction	Always
Minimum value:	0	Long:
Maximum value:	1	+HOT_ErrorEnable
Initial value:	0	Short:
Unit:	None	+HOT_ErrEn
Specify whether or not to enable an error when the over-travel signal in the + direction is detected while commanding to move the axis in the + direction.		
0:	Does not enable an error.	
1:	Enables an error.	
2	Enables the over-travel error function in the - direction	Always
Minimum value:	0	Long:
Maximum value:	1	-HOT_ErrorEnable
Initial value:	0	Short:
Unit:	None	-HOT_ErrEn
Specify whether or not to enable an error when the over-travel signal in the - direction is detected while commanding to move the axis in the - direction.		
0:	Does not enable an error.	
1:	Enables an error.	
4	Selecting the acceleration type	Always
Minimum value:	0	Long:
Maximum value:	1	AccProfeel
Initial value:	0	Short:
Unit:	None	AccProfeel
Select the acceleration type during trapezoidal move.		
0:	Constant acceleration	
1:	S shaped	
5	Selecting the deceleration type	Always
Minimum value:	0	Long:
Maximum value:	1	DecProfeel
Initial value:	0	Short:
Unit:	None	DecProfeel
Select the deceleration type during trapezoidal move.		
0:	Constant deceleration	
1:	S shaped	
7	Acceleration time during a trapezoidal move	Always
Minimum value:	1	Long:
Maximum value:	9999	TaccTrapezoid
Initial value:	1000	Short:
Unit:	msec	TaccTrapez
Specify the acceleration time required for velocity change for the maximum velocity during trapezoidal move.		
8	Deceleration time during a trapezoidal move	Always
Minimum value:	1	Long:
Maximum value:	9999	TdecTrapezoid
Initial value:	1000	Short:
Unit:	msec	TdecTrapez
Specify the deceleration time required for velocity change for the maximum velocity during trapezoidal move.		

9 Feeding Velocity	Always
Minimum value: 0	Long:
Maximum value: 16000000	FeedVelocity
Initial value: Motor dependent	Short:
Unit: Axis command unit/sec	FeedVel
Specify the feeding velocity.	
For trapezoidal move: Specify the feeding velocity.	
For cam move: Specify the feeding velocity (peak velocity).	
10 Jog Velocity	Always
Minimum value: 0	Long:
Maximum value: 16000000	JogVelocity
Initial value: Motor dependent	Short:
Unit: Axis command unit/sec	JogVel
Specify the feeding velocity in jog mode.	
11 Over-travel search velocity during a homing move	Always
Minimum value: 1	Long:
Maximum value: 16000000	ORG-OT_SearchVel
Initial value: Motor dependent	Short:
Unit: Axis command unit/sec	ORG-OT-Vel
Specify the velocity when executing over-travel signal search move in homing mode. This parameter is invalid if the over-travel signal search is not executed.	
12 Homing operation: Home sensor proximity signal search velocity	Always
Minimum value: 1	Long:
Maximum value: 16000000	ORG-ORG_SearchVel
Initial value: Motor dependent	Short:
Unit: Axis command unit/sec	ORG-ORGVel
Specify the velocity to search the home proximity signal in homing mode. This parameter is invalid if the origin proximity signal is not used.	
13 Homing operation: Home sensing feed velocity 1	Always
Minimum value: 1	Long:
Maximum value: 16000000	ORG-Z_Vel1
Initial value: Motor dependent	Short:
Unit: Axis command unit/sec	ORG-Z_Vel1
Specify the velocity when performing the first home sensing move in homing mode. The velocity set here is also used as the feed velocity when performing the following moves in addition to performing the first home sensing move.	
Excessive move for the second home sensing move	
Excessive move for home sensing after a home sensing move	
Homing move after a home sensing move	
15 Homing operation: Origin position offset feed velocity	Always
Minimum value: 1	Long:
Maximum value: 16000000	ORG-OffsetVel
Initial value: Motor dependent	Short:
Unit: Axis command unit/sec	ORG-OffVel
Specify the velocity when executing origin offset move in homing mode. This parameter is invalid if the origin offset is 0.	

16 Velocity override percentage 1	Always
Minimum value: 0	Long:
Maximum value: 20000	VelOverride1
Initial value: 10000	Short:
Unit: 1/100 %	VelOvrrid1
Specify override 1 for feeding velocity.	
20 Homing direction	Always
Minimum value: 0	Long:
Maximum value: 1	ORG-Direction
Initial value: 0	Short:
Unit: None	O-OrgDir
Specify the homing direction (origin proximity signal search direction) in homing mode.	
0: - direction	
1: + direction	
21 Enable/Disable the over-travel signal under the homing mode	Always
Minimum value: 0	Long:
Maximum value: 1	ORG-OT_SignalUse
Initial value: 0	Short:
Unit: None	O-OT_Use
Specify whether or not to execute the over-travel signal search in homing mode.	
0: Disables the over-travel signal search.	
1: Enables the over-travel signal search.	
25 Homing operation: Origin inside selection	Always
Minimum value: 0	Long:
Maximum value: 1	ORG-InsideSelect
Initial value: 1	Short:
Unit: None	O-Inside
If the home sensor proximity signal is used in homing mode, specify whether the Z signal inside the home sensor proximity signal is used as the origin or the Z signal outside the home sensor proximity signal is used as the origin.	
0: The Z signal outside the home sensor proximity signal is used as the origin.	
1: The Z signal inside the home sensor proximity signal is used as the origin.	
27 Enabling the homing flag position error	Always
Minimum value: 0	Long:
Maximum value: 1	ORG-DogErrorEnable
Initial value: 1	Short:
Unit: None	O-DogErrEn
When the homing mode is completed, an error or warning is generated when the relationship between the origin flag position and motor Z-phase position is as follows.	
0: Valid	
1: Invalid	
29 Offset distance from the Home position	Always
Minimum value: -9999999	Long:
Maximum value: 9999999	ORG-Offset
Initial value: 0	Short:
Unit: Axis command unit	O-Offset
Specify the origin offset amount in homing mode.	

31 Operation width under testing mode	Always
Minimum value: 0	Long: TestWidth
Maximum value: 9999999	Short: TestWidth
Initial value: Motor dependent	
Unit: Axis command unit	
Specify the operation width in test mode.	
32 Operation width under Auto-tuning	Always
Minimum value: 1	Long: A-TUNE-Width
Maximum value: 9999999	Short: AT-Width
Initial value: Motor dependent	
Unit: Axis command unit	
Specify the operating range in auto-tuning mode.	
33 Maximum acceleration/deceleration under Auto-tuning	Always
Minimum value: 100	Long: A-TUNE_TaccMax
Maximum value: 9999	Short: AT_TaccMax
Initial value: 9999	
Unit: msec	
Specify the maximum value of acceleration/deceleration time in auto-tuning mode.	
34 Initializing the acceleration/deceleration time while under Auto-tuning	Always
Minimum value: 100	Long: A-TUNE_TacclnI
Maximum value: 9999	Short: AT_TacclnI
Initial value: 1000	
Unit: msec	
Specify the initial value of acceleration/deceleration time in auto-tuning mode.	
38 Servo stiffness settings	Always
Minimum value: -3	Long: ServoRigidity
Maximum value: 5	Short: ServoRigit
Initial value: 3	
Unit: None	
Specify the servo stiffness. (The larger the number is specified, the stronger the servo stiffness becomes. However, the motor vibrates more.)	
1: Velocity control width: 30Hz	Position control width: 7Hz
2: Velocity control width: 40Hz	Position control width: 10Hz
3: Velocity control width: 50Hz	Position control width: 12Hz
4: Velocity control width: 60Hz	Position control width: 15Hz
5: Velocity control width: 70Hz	Position control width: 17Hz
45 Position settling pulse width 2	Always
Minimum value: 0	Long: CoinWidth PIs2
Maximum value: 32767	Short: CoinWidth P2
Initial value: Motor dependent	
Unit: pulse	
Specify the setting width to be used for position settling check and position settling wait in the axis position control section.	
This parameter is used when the position settling width 2 has been selected.	

46 Position settling pulse width 3	Always
Minimum value: 0	Long:
Maximum value: 32767	CoinWidth Pls3
Initial value: Motor dependent	Short:
Unit: pulse	CoinWidth P3
Specify the setting width to be used for position settling check and position settling wait in the axis position control section.	
This parameter is used when the position settling width 3 has been selected.	
47 Position settling pulse width 4	Always
Minimum value: 0	Long:
Maximum value: 32767	CoinWidth Pls4
Initial value: Motor dependent	Short:
Unit: pulse	CoinWidth P4
Specify the setting width to be used for position settling check and position settling wait in the axis position control section.	
This parameter is used when the position settling width 4 has been selected.	
48 Position control bandwidth 2	Always
Minimum value: 1	Long:
Maximum value: 32	PosControlFreq2
Initial value: 2	Short:
Unit: Hz	PosFreq2
Specify the position control bandwidth of the axis position control section. This parameter is set automatically by either executing auto-tuning operation or changing the "servo stiffness settings" parameter.	
This parameter is used when the position control bandwidth 2 has been selected.	
49 Velocity control bandwidth 2	Always
Minimum value: 5	Long:
Maximum value: 200	VelControlFreq2
Initial value: 30	Short:
Unit: Hz	VelFreq2
Specify the control bandwidth of the velocity control section. This parameter is set automatically by either executing auto-tuning operation or changing the "servo stiffness settings" parameter.	
This parameter is used when the velocity control bandwidth 2 has been selected.	
50 Position control bandwidth 1	Always
Minimum value: 1	Long:
Maximum value: 32	PosControlFreq1
Initial value: 1	Short:
Unit: Hz	PosFreq1
Specify the position control bandwidth of the axis position control section. This parameter is set automatically by either executing auto-tuning operation or changing the "servo stiffness settings" parameter.	
This parameter is used when the position control bandwidth 1 has been selected.	
51 Velocity control bandwidth 1	Always
Minimum value: 5	Long:
Maximum value: 200	VelControlFreq1
Initial value: 20	Short:
Unit: Hz	VelFreq1
Specify the control bandwidth of the velocity control section. This parameter is set automatically by either executing auto-tuning operation or changing the "servo stiffness settings" parameter.	
This parameter is used when the velocity control bandwidth 1 has been selected.	

53 Position integral limiting value	Always
Minimum value: 0	Long: PosIntegralLimit
Maximum value: 4999999	Short: PosIntLim
Initial value: 10000	
Unit: None	
Specify the limiter value of the position error integrator in the axis position control section. Specify a smaller value when a wind-up condition occurs during axis operation. This parameter is set automatically by either executing auto-tuning operation or changing the "servo stiffness settings" parameter.	
54 Position feed forward percentage	Always
Minimum value: 0	Long: Position_FF_%
Maximum value: 126	Short: Inch_FF%
Initial value: 90	
Unit: %	
Specify the position feed forward of the axis control section.	
55 Velocity feed forward percentage	Always
Minimum value: 0	Long: Velocity_FF_%
Maximum value: 126	Short: Vel_FF%
Initial value: 100	
Unit: %	
Specify the velocity feed forward.	
56 Acceleration feed forward gain	Always
Minimum value: 0	Long: Accelaration_FF_%
Maximum value: 200	Short: Acc_FF%
Initial value: 0	
Unit: %	
Specify the acceleration feed forward. This parameter calculates the internal gain based on the load inertia/load mass.	
58 Positioning settling pulse width 1	Always
Minimum value: 0	Long: CoinWidth Pls1
Maximum value: 32767	Short: Coin_widthP1
Initial value: 1	
Unit: pulse	
Specify the settling width to be used for position settling check and position settling wait in the axis position control section.	
This parameter is used when the position settling width 1 has been selected.	
59 Position current value filter frequency	Always
Minimum value: 1	Long: PfbMonFilteFreq
Maximum value: 200	Short: PfbFilFrq
Initial value: 10	
Unit: Hz	
Specify the position current value filter frequency. The position current value filter functions when the Using position current value filter parameter is set to "Use." This filter does not function for the position information that is fed back to the position control part.	

61 Position settling signal chattering processing count	Always
Minimum value: 1	Long:
Maximum value: 100	COIN_ChatterVolume
Initial value: 1	Short:
Unit: None	COIN_Vol
Specify the chattering count when a position settling signal is generated. If the absolute values of position deviations (values after being filtered in case a position deviation filter is used) continue to be shorter than the position settling width for the specified number of times, a position settling signal will be formed. Once any of the absolute values becomes out of such range, a position settling signal will not be formed.	
The check cycle is 2 msec.	
65 Value causing an error detection in the (+) or CW direction	Always
Minimum value: 1	Long:
Maximum value: 999999	PosDevErrLimit+
Initial value: 999999	Short:
Unit: pulse	PerrLim+
Specify the + direction detection value when an excessive position deviation error occurs.	
66 Value causing an error detection in the (-) or CCW direction	Always
Minimum value: -999999	Long:
Maximum value: -1	PosDevErrLimit-
Initial value: -999999	Short:
Unit: pulse	PerrLim-
Specify the - direction detection value when an excessive position deviation error occurs.	
68 Torque limit percentage	Always
Minimum value: 0	Long:
Maximum value: 10000	TorqLimit_%
Initial value: 10000	Short:
Unit: 1/100 %	TorqLimit%
This parameter can limit the torque or thrust.	
69 Axis velocity monitoring gain (digital monitor)	Always
Minimum value: 0	Long:
Maximum value: 8	VelMonitorGain(Dig)
Initial value: 0	Short:
Unit: None	VdigMon_G
Specify the axis velocity monitoring gain of the velocity monitor when controlling the digital velocity.	
0: 6.55V / 32768 digits at digital detection velocity	
1: 6.55V / 16384 digits	
2: 6.55V / 8192 digits	
3: 6.55V / 4096 digits	
4: 6.55V / 2048 digits	
5: 6.55V / 1024 digits	
6: 6.55V / 512 digits	
7: 6.55V / 256 digits	
8: 6.55V / 128 digits	

70	Analog monitor selection	Always
Minimum value:	0	Long:
Maximum value:	5	AnalogMonitorSelect
Initial value:	4	Short:
Unit:	None	A_MonSel
Select the content to be output to the analog monitor.		
0:	Position deviation [pulse]	
1:	Test operation response [pulse]	
2:	Position command value [pulse]	
3:	Current position value [pulse]	
4:	Position command differential value (command velocity) [pps]	
5:	Current position differential value (current velocity) [pps]	
71	Axis positioning error monitoring gain (analog monitor)	Always
Minimum value:	0	Long:
Maximum value:	8	PerrMonitorGain
Initial value:	0	Short:
Unit:	None	PerrMon_G
Specify the position deviation monitoring gain of the analog monitor.		
0:	6.55V / 32768 pulses	
1:	6.55V / 16384 pulses	
2:	6.55V / 8192 pulses	
3:	6.55V / 4096 pulses	
4:	6.55V / 2048 pulses	
5:	6.55V / 1024 pulses	
6:	6.55V / 512 pulses	
7:	6.55V / 256 pulses	
8:	6.55V / 128 pulses	
72	Test operation monitoring gain (analog monitor)	Always
Minimum value:	0	Long:
Maximum value:	8	TestMonitorGain
Initial value:	0	Short:
Unit:	None	PerrMon_G
Specify the test operation response monitoring gain of the analog monitor.		
0:	6.55V / 32768 pulses	
1:	6.55V / 16384 pulses	
2:	6.55V / 8192 pulses	
3:	6.55V / 4096 pulses	
4:	6.55V / 2048 pulses	
5:	6.55V / 1024 pulses	
6:	6.55V / 512 pulses	
7:	6.55V / 256 pulses	
8:	6.55V / 128 pulses	

73 Position monitoring gain (analog monitor)	Always
Minimum value: 0	Long:
Maximum value: 14	PosMonitorGain
Initial value: 0	Short:
Unit: None	PosMon_G
Specify the position monitoring (position command value and current position value) gain of the analog monitor.	
0: 6.55V / 4194304 pulses	
1: 6.55V / 2097152 pulses	
2: 6.55V / 1048576 pulses	
3: 6.55V / 524288 pulses	
4: 6.55V / 262144 pulses	
5: 6.55V / 131072 pulses	
6: 6.55V / 65536 pulses	
7: 6.55V / 32768 pulses	
8: 6.55V / 16384 pulses	
9: 6.55V / 8192 pulses	
10: 6.55V / 4096 pulses	
11: 6.55V / 1024 pulses	
12: 6.55V / 512 pulses	
13: 6.55V / 256 pulses	
14: 6.55V / 128 pulses	
74 Position differential value monitoring gain (analog monitor)	Always
Minimum value: 0	Long:
Maximum value: 7	VelMonitorGain
Initial value: 0	Short:
Unit: None	VelMon_G
Specify the position differential value monitoring (position command differential value and current position differential value) gain of the analog monitor.	
0: 6.55V / 8192000 pulses	
1: 6.55V / 4096000 pulses	
2: 6.55V / 2048000 pulses	
3: 6.55V / 1024000 pulses	
4: 6.55V / 512000 pulses	
5: 6.55V / 256000 pulses	
6: 6.55V / 128000 pulses	
7: 6.55V / 64000 pulses	
75 Velocity monitor selection (digital monitor)	Always
Minimum value: 0	Long:
Maximum value: 1	VelMonSel(Digital)
Initial value: 0	Short:
Unit: None	VelMonSelD
This parameter switches the velocity monitoring output content when controlling the digital velocity.	
0: Velocity monitor	
1: Velocity monitor AC	
89 Brake turn OFF delay time upon Servo ON	Always
Minimum value: 0	Long:
Maximum value: 2000	TimeSrvOn_toBrkOff
Initial value: 0	Short:
Unit: msec	TimeBrkOff
Specify the delay time from servo ON to brake OFF.	
90 Advanced Brake turn ON before Servo OFF	Always
Minimum value: 0	Long:
Maximum value: 000	TimeBrkOn_toSrvOff
Initial value: 0	Short:
Unit: msec	TimeBrkOn
Specify the advanced time for brake ON before servo OFF.	

91 TBX_EMG Servo status	Always
Minimum value: 0	Long:
Maximum value: 5	TbxEmgServoCondition
Initial value: 0	Short:
Unit: None	TbxEmgServ

Specify the servo status of the motor when EMG from TBX is executed.

When operating the built-in controller axis:

- 0: Maintains the servo status after the axis operation stops (low level).
- 1: Turns the servo OFF after the axis operation stops (low level).
- 2: Stops the axis operation (low level) and turns the servo OFF immediately.
- 3: Maintains the servo status after the axis operation stops (high level).
- 4: Turns the servo OFF after the axis operation stops (high level).
- 5: Stops the axis operation (high level) and turns the servo OFF immediately.

When performing the higher controller follow-up:

- 0: Switches to the built-in controller, and maintains the servo status after a deceleration stop.
- 1: Switches to the built-in controller, and turns the servo OFF after a deceleration stop.
- 2: Switches to the built-in controller, performs a deceleration stop, and turns the servo OFF immediately.
- 3: Switches to the built-in controller, and maintains the servo status after an immediate stop.
- 4: Switches to the built-in controller, and turns the servo OFF after an immediate stop.
- 5: Switches to the built-in controller, performs an immediate stop, and turns the servo OFF immediately.

93 IFB_EMG Servo status	Always
Minimum value: 0	Long:
Maximum value: 5	IfbEmgServoCondition
Initial value: 0	Short:
Unit: None	IfbEmgServ

Specify the servo status of the motor when executing EMG from the interface board.

When operating the built-in controller axis:

- 0: Maintains the servo status after the axis operation stops (low level).
- 1: Turns the servo OFF after the axis operation stops (low level).
- 2: Stops the axis operation (low level) and turns the servo OFF immediately.
- 3: Maintains the servo status after the axis operation stops (high level).
- 4: Turns the servo OFF after the axis operation stops (high level).
- 5: Stops the axis operation (high level) and turns the servo OFF immediately.

When performing the higher controller follow-up:

- 0: Switches to the built-in controller, and maintains the servo status after a deceleration stop.
- 1: Switches to the built-in controller, and turns the servo OFF after a deceleration stop.
- 2: Switches to the built-in controller, performs a deceleration stop, and turns the servo OFF immediately.
- 3: Switches to the built-in controller, and maintains the servo status after an immediate stop.
- 4: Switches to the built-in controller, and turns the servo OFF after an immediate stop.
- 5: Switches to the built-in controller, performs an immediate stop, and turns the servo OFF immediately.

94	Position command differential value excessive error processing type	Always
Minimum value:	0	Long:
Maximum value:	5	Over_dScmdErrorType
Initial value:	1	Short:
Unit:	None	OVP_ErrTyp

Specify the processing type when a position command differential value excessive error occurs.

When operating the built-in controller axis:

- 0: Maintains the servo status after the axis operation stops (low level).
- 1: Turns the servo OFF after the axis operation stops (low level).
- 2: Stops the axis operation (low level) and turns the servo OFF immediately.
- 3: Maintains the servo status after the axis operation stops (high level).
- 4: Turns the servo OFF after the axis operation stops (high level).
- 5: Stops the axis operation (high level) and turns the servo OFF immediately.

When performing the higher controller follow-up:

- 0: Switches to the built-in controller, and maintains the servo status after a deceleration stop.
- 1: Switches to the built-in controller, and turns the servo OFF after a deceleration stop.
- 2: Switches to the built-in controller, performs a deceleration stop, and turns the servo OFF immediately.
- 3: Switches to the built-in controller, and maintains the servo status after an immediate stop.
- 4: Switches to the built-in controller, and turns the servo OFF after an immediate stop.
- 5: Switches to the built-in controller, performs an immediate stop, and turns the servo OFF immediately.

95	Over-travel error function in the + direction processing type	Always
Minimum value:	0	Long:
Maximum value:	5	+Hot_ErrorType
Initial value:	1	Short:
Unit:	None	+Hot_ErrTyp

Specify the processing type when an over-travel error in the + direction occurs.

When operating the built-in controller axis:

- 0: Maintains the servo status after the axis operation stops (low level).
- 1: Turns the servo OFF after the axis operation stops (low level).
- 2: Stops the axis operation (low level) and turns the servo OFF immediately.
- 3: Maintains the servo status after the axis operation stops (high level).
- 4: Turns the servo OFF after the axis operation stops (high level).
- 5: Stops the axis operation (high level) and turns the servo OFF immediately.

When performing the higher controller follow-up:

- 0: Switches to the built-in controller, and maintains the servo status after a deceleration stop.
- 1: Switches to the built-in controller, and turns the servo OFF after a deceleration stop.
- 2: Switches to the built-in controller, performs a deceleration stop, and turns the servo OFF immediately.
- 3: Switches to the built-in controller, and maintains the servo status after an immediate stop.
- 4: Switches to the built-in controller, and turns the servo OFF after an immediate stop.
- 5: Switches to the built-in controller, performs an immediate stop, and turns the servo OFF immediately.

96	Over-travel error function in the - direction processing type	Always
Minimum value:	0	Long:
Maximum value:	5	-Hot_ErrorType
Initial value:	1	Short:
Unit:	None	-Hot_ErrTyp
Specify the processing type when an over-travel error in the - direction occurs.		
When operating the built-in controller axis:		
0:	Maintains the servo status after the axis operation stops (low level).	
1:	Turns the servo OFF after the axis operation stops (low level).	
2:	Stops the axis operation (low level) and turns the servo OFF immediately.	
3:	Maintains the servo status after the axis operation stops (high level).	
4:	Turns the servo OFF after the axis operation stops (high level).	
5:	Stops the axis operation (high level) and turns the servo OFF immediately.	
When performing the higher controller follow-up:		
0:	Switches to the built-in controller, and maintains the servo status after a deceleration stop.	
1:	Switches to the built-in controller, and turns the servo OFF after a deceleration stop.	
2:	Switches to the built-in controller, performs a deceleration stop, and turns the servo OFF immediately.	
3:	Switches to the built-in controller, and maintains the servo status after an immediate stop.	
4:	Switches to the built-in controller, and turns the servo OFF after an immediate stop.	
5:	Switches to the built-in controller, performs an immediate stop, and turns the servo OFF immediately.	
98	Deceleration time for immediate stop during trapezoidal move	Always
Minimum value:	1	Long:
Maximum value:	9999	TdecTrapezHighAbort
Initial value:	1	Short:
Unit:	msec	TdecT_High
Specify the deceleration time required to change the velocity from the maximum velocity when stopping immediately during a trapezoidal move.		
106	Settling wait enable	Always
Minimum value:	0	Long:
Maximum value:	1	CoinEnable
Initial value:	1	Short:
Unit:	None	CoinEnable
Specify whether or not to execute a settling wait for the move followed by positioning when the axis move operation is completed. For the move that is not followed by positioning, the settling wait is not executed regardless of this parameter setting. The settling wait is executed in homing mode regardless of this parameter setting.		
0:	Does not execute settling wait.	
1:	Executes settling wait.	
152	First order delay compensator setting	Always
Minimum value:	0	Long:
Maximum value:	3	CompFilterSel
Initial value:	0	Short:
Unit:	None	FilterSel
Specify the first order delay compensator.		
0:	No first order delay compensator	
1:	20Hz/80Hz	
2:	30Hz/120Hz	
3:	40Hz/160Hz	

153 Notch filter: Frequency 1 selection	Always
Minimum value: 50	Long:
Maximum value: 1500	NotchFilterFreq1
Initial value: 1500	Short:
Unit: Hz	NotchFreq1
Specify the frequency of notch filter channel 1 for the driver equipped with the notch filter option. This parameter is no valid for the driver without the notch filter option.	
154 Notch filter: Frequency 2 selection	Always
Minimum value: 50	Long:
Maximum value: 1500	NotchFilterFreq2
Initial value: 1500	Short:
Unit: Hz	NotchFreq2
Specify the frequency of notch filter channel 2 for the driver equipped with the notch filter option. This parameter is no valid for the driver without the notch filter option.	
155 Load inertia/load mass	Always
Minimum value: 0	Long:
Maximum value: 200000	Load_J_or_M
Initial value: 0	Short:
Unit: 1/1000kgm ² or 1/1000kg	LoadJ_or_M
Specify the load inertia or load mass mounted on the motor. If an auto-tuning operation is executed, the measured value will be set automatically.	
201 Selection of English/Japanese display	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	EnglishDisplay
Initial value: 0	Short:
Unit: None	EnglishDsp
Specify whether English display or Japanese display is used.	
0: Japanese display	
1: English display	
202 Coordinate (+) direction setting	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	AxisCoordinateDir
Initial value: 1	Short:
Unit: None	AxCoordDir
Specify the coordinate system direction.	
0:	
1:	
203 Using position current value filter	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	UsePfbMonFilter
Initial value: Motor dependent	Short:
Unit: None	UsePfbFil
Specify whether or not to use a filter to generate the position current value. However, the filter will not function for the position information that is fed back to the position control part, regardless of the setting of this parameter.	
0: Do not use.	
1: Use.	

204 Command pulse type	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 2	CmdPlsType
Initial value: 2	Short:
Unit: None	CmdPlsType
Specify the position command pulse type.	
0: PUA_IN:UP, SDB_IN:DOWN	
1: PUA_IN:A, SDB_IN:B	
2: PUA_IN:PLS, SDB_IN:SIGN	
205 Monitor pulse type	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	MonPlsType
Initial value: 1	Short:
Unit: None	MonPlsType
Specify the position monitor command pulse type.	
0: UA_OUT:UP, DB_OUT:DOWN	
1: UA_OUT:A, DB_OUT:B	
206 Enabling current limit external input	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	ExtCurLmtEn
Initial value: 0	Short:
Unit: None	ExCurLmtEn
Specify whether or not to perform a current limit according to the current limit external input signal.	
0: Do not perform.	
1: Perform.	
207 Simplified scaling weighted data	While in machine setting mode
Minimum value: 1	Long:
Maximum value: 64	CmdWeight
Initial value: 4	Short:
Unit: None	CmdWeight
Specify how many pulses a single command unit equals to during a simplified scaling operation. Specify in a power of 2 (e.g., 1, 2, 4, 8, ...).	
213 Axis maximum velocity	While in machine setting mode
Minimum value: 1	Long:
Maximum value: 16000000	Vmax
Initial value: Motor dependent	Short:
Unit: Axis command unit/sec	Vmax
Specify the maximum velocity during operation. The actual maximum velocity is determined by the smaller value of this parameter or the maximum velocity [axis command unit/sec] converted from the maximum velocity [rps, mps] determined by the motor and driver. This maximum velocity value is displayed on the monitor.	
218 Enables error when over-load occurs	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	OverloadErrorEn
Initial value: 1	Short:
Unit: None	OVL_ErrEn
Specify whether or not to process as an error when over-load occurs.	
0: Does not process as an error.	
1: Processes as an error.	

219 Velocity feedback filter use	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	UseVfbFilter
Initial value: 0	Short:
Unit: None	UseVfbFil
Specify whether or not to use a filter for the velocity information that is fed back to the velocity control part.	
0: Do not use.	
1: Use.	
220 Velocity feedback filter bandwidth	While in machine setting mode
Minimum value: 50	Long:
Maximum value: 1000	VfbFilterFreq
Initial value: 1000	Short:
Unit: Hz	VfbFilFreq
Specify the bandwidth of a filter to be applied to the velocity information that is fed back to the velocity control part.	
The velocity feedback filter functions when the Using velocity feedback filter parameter is set to "Use."	
221 Velocity command filter bandwidth	While in machine setting mode
Minimum value: 50	Long:
Maximum value: 1000	VcmdFilterFreq
Initial value: 1000	Short:
Unit: Hz	VcmdFilFrq
Specify the bandwidth of a filter to be applied to the velocity command value that is an output from the position control part.	
222 Enables error when over-speed occurs	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	OverSpeedErrorEn
Initial value: 1	Short:
Unit: None	OVS_ErrEn
Specify whether or not to process as an error when over-speed occurs.	
0: Does not process as an error.	
1: Processes as an error.	
224 Enables error when excessive position deviation occurs	While in machine setting mode
Minimum value: 0	Long:
Maximum value: 1	OverPerrErrorEn
Initial value: 1	Short:
Unit: None	OVPe_ErrEn
Specify whether or not to process as an error when an excessive position deviation occurs.	
0: Does not process as an error.	
1: Processes as an error.	

227 Over-speed error processing type

While in machine setting mode

Minimum value: 0

Long:

OverSpeedErrorType

Maximum value: 5

Short:

OVS_ErrTyp

Initial value: 1

Unit: None

Specify the processing type when an over-speed error occurs.

When operating the built-in controller axis:

- 0: Maintains the servo status after the axis operation stops (low level).
- 1: Turns the servo OFF after the axis operation stops (low level).
- 2: Stops the axis operation (low level) and turns the servo OFF immediately.
- 3: Maintains the servo status after the axis operation stops (high level).
- 4: Turns the servo OFF after the axis operation stops (high level).
- 5: Stops the axis operation (high level) and turns the servo OFF immediately.

When performing the higher controller follow-up:

- 0: Switches to the built-in controller, and maintains the servo status after a deceleration stop.
- 1: Switches to the built-in controller, and turns the servo OFF after a deceleration stop.
- 2: Switches to the built-in controller, performs a deceleration stop, and turns the servo OFF immediately.
- 3: Switches to the built-in controller, and maintains the servo status after an immediate stop.
- 4: Switches to the built-in controller, and turns the servo OFF after an immediate stop.
- 5: Switches to the built-in controller, performs an immediate stop, and turns the servo OFF immediately.

228 Over-load error processing type

While in machine setting mode

Minimum value: 0

Long:

OverloadErrorType

Maximum value: 5

Short:

OVL_ErrTyp

Initial value: 1

Unit: None

Specify the processing type when an over-load error occurs.

When operating the built-in controller axis:

- 0: Maintains the servo status after the axis operation stops (low level).
- 1: Turns the servo OFF after the axis operation stops (low level).
- 2: Stops the axis operation (low level) and turns the servo OFF immediately.
- 3: Maintains the servo status after the axis operation stops (high level).
- 4: Turns the servo OFF after the axis operation stops (high level).
- 5: Stops the axis operation (high level) and turns the servo OFF immediately.

When performing the higher controller follow-up:

- 0: Switches to the built-in controller, and maintains the servo status after a deceleration stop.
- 1: Switches to the built-in controller, and turns the servo OFF after a deceleration stop.
- 2: Switches to the built-in controller, performs a deceleration stop, and turns the servo OFF immediately.
- 3: Switches to the built-in controller, and maintains the servo status after an immediate stop.
- 4: Switches to the built-in controller, and turns the servo OFF after an immediate stop.
- 5: Switches to the built-in controller, performs an immediate stop, and turns the servo OFF immediately.

229 Excessive position deviation error processing type**While in machine setting mode****Minimum value:** 0**Long:**

OverSpeedErrorType

Maximum value: 5**Short:**

OVPeErrTyp

Initial value: 1**Unit:** None

Specify the processing type when an excessive position deviation error occurs.

When operating the built-in controller axis:

- 0: Maintains the servo status after the axis operation stops (low level).
- 1: Turns the servo OFF after the axis operation stops (low level).
- 2: Stops the axis operation (low level) and turns the servo OFF immediately.
- 3: Maintains the servo status after the axis operation stops (high level).
- 4: Turns the servo OFF after the axis operation stops (high level).
- 5: Stops the axis operation (high level) and turns the servo OFF immediately.

When performing the higher controller follow-up:

- 0: Switches to the built-in controller, and maintains the servo status after a deceleration stop.
- 1: Switches to the built-in controller, and turns the servo OFF after a deceleration stop.
- 2: Switches to the built-in controller, performs a deceleration stop, and turns the servo OFF immediately.
- 3: Switches to the built-in controller, and maintains the servo status after an immediate stop.
- 4: Switches to the built-in controller, and turns the servo OFF after an immediate stop.
- 5: Switches to the built-in controller, performs an immediate stop, and turns the servo OFF immediately.

Monitor List

STD1

Monitor No.	Monitor name	Unit
300	Currently under operation	None
301	Axis is under operation	None
302	Error status	None
303	Alarm status	None
304	Driver ready	None
305	Servo ready	None
310	Display of program number under execution	None
317	Completion of homing status display	None
318	Homing operation: The measured value	pulse
320	Pulse position command value	pulse
321	Pulse position current value	pulse
322	Pulse position deviation	pulse
323	Command unit command value	Axis command unit
324	Scaling data (command unit side)	Axis command unit
325	Scaling data (pulse side)	pulse
328	Position settling status	None
335	Interface ready	None
337	Overload status	None
338	Zero signal status	None
339	Sensor group signal status	None
340	Excessive position deviation status	None
341	Excessive velocity status	None
342	Braking OFF	None
343	Position control integral main switch status	None
345	Error code (main)	None
346	Error code (sub)	None
347	Operation mode number	None
348	Multi-channel communication status	None
349	Multi-channel communication slave code	None
354	Maximum motor pulse velocity	pulse/sec

Monitor No.	Monitor name	Unit
355	Monitor resolution	pulse/rev, pulse/m
356	Digital velocity sensitivity	digit/rps, digit/mps
357	Maximum velocity	Axis command unit/sec
358	Z-phase signal pulse interval	pulse/rev, pulse/m
360	Load ratio	x 1/100
361	Velocity ratio gain	x 1/100
363	Velocity command value (digital)	1/16 digit
364	Post-filter velocity command value (digital)	1/16 digit
365	Present velocity value	1/16 digit
366	Present post-filter velocity value	1/16 digit
367	Velocity deviation (digital)	1/16 digit
368	Current command value (D/A)	digit
369	Present current value (A/D)	digit
370	Present command unit value	Axis command unit
371	Command unit deviation	Axis command unit
372	Present velocity value DC	1/16 digit
373	Motor linear coordinate command second-order differential value	pulse/ ΔT^2
374	Acceleration feed forward command value	digit
375	Position control bandwidth	Hz
376	Velocity control bandwidth	Hz
377	Position settling width	pulse
384	Motor linear coordinate current value after filtering	pulse
390	Motor linear coordinate command differential value	pulse/ ΔT
391	Present motor linear coordinate differential value	pulse/ ΔT
392	Pre-filter current square duty	digit
393	Post-filter current square duty	digit
396	Driver code	None
398	Motor code	None
399	Time after power ON [msec]	msec

300 Currently under operation**Unit:** None

Indicates that an operation is being performed.

301 Axis is under operation**Unit:** None

Indicates that an axis operation is being performed.

302 Error status**Unit:** None

Indicates the error status.

303 Alarm status**Unit:** None

Indicates the alarm status.

304 Driver ready**Unit:** None

Indicates that the driver is ready.

305 Servo ready**Unit:** None

Indicates that the servo is ready.

310 Display of program number under execution**Unit:** None

Indicates the program number during execution or after execution.

317 Completion of homing status display**Unit:** None

Indicates whether a homing operation has been completed after the power is turned on.

318 Homing operation: The measured value**Unit:** pulse

Indicates the distance between the neighboring signal and origin that is measured during homing operation.

320 Pulse position command value

Unit: pulse

Displays the pulse position command value.

321 Pulse position current value

Unit: pulse

Displays the current pulse position value.

322 Pulse position deviation

Unit: pulse

Displays the pulse position deviation.

323 Command unit command value

Unit: Axis command unit

Displays the command unit command value.

324 Scaling data (command unit side)

Unit: Axis command unit

Displays the axis scaling data (command unit side) that is actually used.

325 Scaling data (pulse side)

Unit: pulse

Displays the axis scaling data (pulse side) that is actually used.

328 Position settling status

Unit: None

Indicates that the axis position deviation is within the specified range.

335 Interface ready

Unit: None

Indicates that the PLC interface is ready.

337 Overload status

Unit: None

Displays the overload status.

338 Zero signal status

Unit: None

Displays the zero signal status.

339 Sensor group signal status

Unit: None

Displays the sensor group signal status. Each bit in binary notation corresponds as follows:

bit0: (Reserved)

bit1: (Reserved)

bit2: (Reserved)

bit3: (Reserved)

bit4: ORG Origin neighboring signal

bit5: OTU + direction hardware over-travel signal

bit6: OTD - direction hardware over-travel signal

bit7: (Reserved)

340 Excessive position deviation status

Unit: None

Displays the excessive position deviation status.

341 Excessive velocity status

Unit: None

Displays the excessive velocity status.

342 Braking OFF

Unit: None

Indicates that the brake signal is OFF.

343 Position control integral main switch status

Unit: None

Displays the position control integral main switch status (0: OFF-disable, 1: ON-enable).

345 Error code (main)

Unit: None

Displays the error code (main code).

346 Error code (sub)

Unit: None

Displays the error code (subcode).

347 Operation mode number

Unit: None

Indicates the operation mode number during or after operation.

348 Multi-channel communication status

Unit: None

Indicates that the multi-channel communication status has been set.

0: Single channel communication status

1: multi-channel communication status

349 Multi-channel communication slave code

Unit: None

Indicates the slave station (self-station) code in multi-channel communication.

354 Maximum motor pulse velocity

Unit: pulse/sec

Displays the maximum velocity defined for the motor/driver.

355 Monitor resolution

Unit: pulse/rev, pulse/m

Displays the monitor resolution.

356 Digital velocity sensitivity

Unit: digit/rps, digit/mps

Displays the digital velocity sensitivity.

357 Maximum velocity

Unit: Axis command unit/sec

This parameter is defined by the smaller value of the maximum velocity [axis command unit/sec] set by the user and the maximum velocity [axis command unit/sec] converted from the maximum velocity [rps, mps] set by the motor and driver. The position command velocity is restricted by this value. In addition, for trapezoidal (constant acceleration/deceleration) move, the inclination of acceleration/deceleration is calculated from the acceleration/deceleration time parameter, feed velocity parameter in operation mode, and this parameter value.

358 Z-phase signal pulse interval

Unit: pulse/rev, pulse/m

Displays the Z-phase signal pulse interval.

360 Load ratio

Unit: x 1/100

Displays the load inertia/self-inertia and load mass/self-mass.

361 Velocity ratio gain

Unit: x 1/100

Displays the velocity loop ratio gain.

363 Velocity command value (digital)

Unit: 1/16 digit

Displays the velocity command value when controlling the digital velocity. (1msec sample)

364 Post-filter velocity command value (digital)

Unit: 1/16 digit

Displays the post-filter velocity command value when controlling the digital velocity. (1msec sample)

365 Present velocity current value

Unit: 1/16 digit

Displays the present velocity value. (1msec sample)

366 Present post-filter velocity value

Unit: 1/16 digit

Displays the present post-filter velocity value. (1msec sample)

367 Velocity deviation (digital)

Unit: 1/16 digit

Displays the velocity deviation. (1msec sample)

368 Current command value (D/A)

Unit: digit

Displays the current command value D/A output value. The conversion rate is as follows:

1 digit = 0.0036%

27853 digits: +100%

0 digits: 0%

-27853 digits: -100%

369 Present current value (A/D)

Unit: digit

Displays the A/D input value of the present current command value.(1msec sample) The conversion rate is as follows:

1 digit = 0.0036%

27840digits: +100%

0 digits: 0%

-27840 digits: -100%

370 Present command unit value

Unit: Axis command unit

Displays the present command unit value.

371 Command unit deviation

Unit: Axis command unit

Displays the command unit deviation.

372 Present velocity value DC

Unit: 1/16 digit

Displays the present velocity value DC. (10msec sample)

373 Motor linear coordinate command second-order differential value

Unit: pulse/ ΔT^2

Displays the second-order differential value of the motor linear coordinate command value (example: 2 msec).

374 Acceleration feed forward command value

Unit: digit

Displays the acceleration feed command value.

375 Position control bandwidth

Unit: Hz

Displays the position control bandwidth.

376 Velocity control bandwidth

Unit: Hz

Displays the velocity control bandwidth.

377 Position settling width

Unit: pulse

Displays the position settling width.

384 Motor linear coordinate current value after filtering

Unit: pulse

Displays the eccentricity-compensated motor linear coordinate current value after position current value filter processing.

390 Motor linear coordinate command differential value

Unit: pulse/ΔT

Displays the differential value of the motor linear coordinate command value. (2msec sample)

391 Present motor linear coordinate differential value

Unit: pulse/ΔT

Displays the differential value of the present motor linear coordinate value. (2msec sample)

392 Pre-filter current square duty

Unit: digit

Displays the pre-filter current square duty (decimal point 15 bits).

393 Post-filter current square duty

Unit: digit

Displays the post-filter current square duty (decimal point 15 bits)

396 Driver code

Unit: None

Displays the driver code.

398 Motor code

Unit: None

Displays the motor code.

399 Time after power ON [msec]

Unit: msec

Indicates the time after the power has been turned on.

Error/Alarm List

STD1

Error No.	Name	Type	Measures
1	Memory error	[KIND_POR] Start-up error	[TYPE_POR] Do not start up.
2	Interface board error	[KIND_POR] Start-up error	[TYPE_POR] Do not start up.
3	Battery alarm	[KIND_ELS] Others	[TYPE_ELS] Others
4	Watchdog error	[KIND_SYS] System error	[TYPE_ELS] Others
5	Kernel error	[KIND_SYS] System error	[TYPE_ELS] Others
10	Data sum error	[KIND_POR] Start-up error	[TYPE_POR] Do not start up.
11	Data error	[KIND_POR] Start-up error	[TYPE_POR] Do not start up.
15	Encoder error	[KIND_SYS] System error	[TYPE_SRV] Servo OFF
16	Coordinate error A	[KIND_SYS] System error	[TYPE_SRV] Servo OFF
17	Coordinate error B	[KIND_ERRALM2] Error/operation alarm	[TYPE_E2] Stop deceleration.
18	Monitor pulse output error	[KIND_SYS] System error	[TYPE_SRV] Servo OFF
19	Slave drive error	[KIND_RGR] Always error	[TYPE_SRV] Servo OFF
20	Power module error	[KIND_RGR] Always error	[TYPE_SRV] Servo OFF
21	AC power error	[KIND_SRV] Servo error	[TYPE_SRV] Servo OFF
22	Over load	[KIND_RGR] Always error	[TYPE_ELS] Others
23	Excessive position deviation	[KIND_SRV] Servo error	[TYPE_ELS] Others
24	Over speed	[KIND_RGR] Always error	[TYPE_ELS] Others
30	Servo not ready	[KIND_ERR] error	[TYPE_E2] Stop deceleration.
31	Excessive position command differential value	[KIND_ERR] error	[TYPE_ELS] Others
42	+ direction hardware over-travel	[KIND_ERR] error	[TYPE_ELS] Others
43	- direction hardware over-travel	[KIND_ERR] error	[TYPE_ELS] Others
44	+ direction software over-travel	[KIND_ERR] error	[TYPE_E2] Stop deceleration.
45	- direction software over-travel	[KIND_ERR] error	[TYPE_E2] Stop deceleration.
46	Emergency stop	[KIND_RGR] Always error	[TYPE_ELS] Others
49	Homing error	[KIND_ERRALM1] Error/operation alarm	[TYPE_E2] Stop deceleration.
50	Cannot execute	[KIND_ERRALM2] Error/operation alarm	[TYPE_E2] Stop deceleration.
51	Data not ready	[KIND_ERRALM2] Error/operation alarm	[TYPE_E2] Stop deceleration.
52	Timeout	[KIND_ERRALM1] Error/operation alarm	[TYPE_E2] Stop deceleration.
53	Cannot calculate	[KIND_ERRALM1] Error/operation alarm	[TYPE_E2] Stop deceleration.
60	Cannot interpret	[KIND_ERRALM2] Error/operation alarm	[TYPE_E2] Stop deceleration.
61	Command format error	[KIND_ERRALM2] Error/operation alarm	[TYPE_E2] Stop deceleration.
62	Data is out of range	[KIND_ERRALM2] Error/operation alarm	[TYPE_E2] Stop deceleration.
63	Operation error	[KIND_ALM] Operation alarm	[TYPE_E2] Stop deceleration.
65	Illegal parameter and monitor number	[KIND_ERRALM2] Error/operation alarm	[TYPE_E2] Stop deceleration.
66	Illegal device	[KIND_ALM] Operation alarm	[TYPE_E2] Stop deceleration.
67	Write protected	[KIND_ERRALM2] Error/operation alarm	[TYPE_E2] Stop deceleration.
80	No such command	[KIND_ALM] Operation alarm	[TYPE_E2] Stop deceleration.
81	Not registered	[KIND_ALM] Operation alarm	[TYPE_E2] Stop deceleration.
82	Out of memory	[KIND_ALM] Operation alarm	[TYPE_E2] Stop deceleration.
85	Device conflict	[KIND_ALM] Operation alarm	[TYPE_E2] Stop deceleration.

Error/Alarm Details

Error number	1	Memory error	Long:	
Error type:	[KIND_POR]	Start-up error	MemoryError	
Measures:	[TYPE_POR]	Do not start up.	MemoryErr	
Main cause:	An error is detected during memory check when the power is turned on. [Subcode] 1: CPU built-in ROM sum error 2: RAM error 3: Flash ROM sum error			
Action to take:	Contact us.			
Error number	2	Interface board error	Long:	
Error type:	[KIND_POR]	Start-up error	InterfaceBoardError	
Measures:	[TYPE_POR]	Do not start up.	IFB_Err	
Main cause:	Failed to initialize the interface board.			
Action to take:	Contact us.			
Error number	3	Battery alarm	Long:	
Error type:	[KIND_ELS]	Others	BatteryAlarm	
Measures:	[TYPE_ELS]	Others	BatteryAlm	
Main cause:	Battery voltage for memory backup is low.			
Action to take:	Replace with a new lithium battery.			
Error number	4	Watchdog error	Long:	
Error type:	[KIND_SYS]	System error	WatchdogError	
Measures:	[TYPE_ELS]	Others	Watchdog	
Main cause:	A watchdog timer error occurred. The driver will be set in the reset status.			
Action to take:	Contact us.			

Error number	5	Kernel error	Long: KernelError
Error type:	[KIND_SYS] System error	Short:	KernelErr
Measures:	[TYPE_ELS] Others		
Main cause:	An error that should have not occurred in driver software has occurred. [Subcode] 1: Axis operation handshake error 2: System program error		
Action to take:	Contact us.		
Error number	10	Data sum error	Long: DataSumError
Error type:	[KIND_POR] Start-up error	Short:	DataSumErr
Measures:	[TYPE_POR] Do not start up.		
Main cause:	Destroyed data was detected during data check when the power was turned on. [Subcode] 1: Parameter file 2: Parts data file 3: Program file 4: Index correction file 5: I/O logic setting file 6: Index file Type B 7: Absolute accuracy compensation file		
Action to take:	Perform the Reset All operation, and download all backup data.		
Error number	11	Data error	Long: DataError
Error type:	[KIND_POR] Start-up error	Short:	DataError
Measures:	[TYPE_POR] Do not start up.		
Main cause:	Data that cannot be processed was detected when the power was turned on. [Subcode] 1: Basic data and adjustment data problem 2: Servo constant problem		
Action to take:	Contact us.		
Error number	15	Encoder error	Long: EncoderError
Error type:	[KIND_SYS] System error	Short:	EncoderErr
Measures:	[TYPE_SRV] Servo OFF		
Main cause:	An encoder and revolver signal problem was detected. [Subcode] 1: No SIG0 signal edge 2: No SIG1 signal edge 3: SIG0 signal cycle problem 4: SIG1 signal cycle problem		
Action to take:	Contact us.		

Error number	16 Coordinate error A	Long: CoordinateErrorA
Error type:	[KIND_SYS] System error	Short: CoordiErrA
Measures:	[TYPE_SRV] Servo OFF	
Main cause:	An error occurred during coordinate processing. [Subcode] 1: Eccentricity compensation computation problem 2: Conversion problem from the command unit to pulses	
Action to take:		

Error number	17 Coordinate error B	Long: CoordinateErrorB
Error type:	[KIND_ERRALM2] Error/operation alarm	Short: CoordiErrB
Measures:	[TYPE_E2] Stop deceleration.	
Main cause:	An error occurred during coordinate processing. [Subcode] 1: Executed the process that was prohibited in the coordinate non-settling status. 2: Out of the command coordinate area 3: Executed a process using the setting that is prohibited.	
Action to take:		

Error number	18 Monitor pulse output error	Long: MonitorPulseError
Error type:	[KIND_SYS] System error	Short: MonPlsErr
Measures:	[TYPE_SRV] Servo OFF	
Main cause:	Monitor pulses cannot be output.	
Action to take:		

Error number	19 Slave drive error	Long: SlaveDriveError
Error type:	[KIND_RGR] Always error	Short: SlvDrvErr
Measures:	[TYPE_SRV] Servo OFF	
Main cause:	A tandem slave driver error occurred.	
Action to take:	Check the error code of the tandem slave driver, and take measures against the tandem slave driver problem. This error occurs only if the driver is the tandem master driver.	

Error number	20	Power module error	Long: PowerModuleError
Error type:	[KIND_RGR] Always error	Short:	PwrMdlErr
Measures:	[TYPE_SRV] Servo OFF		
Main cause:	A power module error in the driver was detected.		
	[Subcode]		
	1: Over-voltage (over-voltage of main power supply)		
	2: Over-current (over-current detected, 1 PM fault)		
Action to take:			
Error number	21	AC power error	Long: AC_PowerError
Error type:	[KIND_SRV] Servo error	Short:	AC_PwrErr
Measures:	[TYPE_SRV] Servo OFF		
Main cause:	Either the main power supply is not input or the input voltage has not reached the rating level.		
Action to take:	Verify the main power supply.		
Error number	22	Over load	Long: Overload
Error type:	[KIND_RGR] Always error	Short:	Overload
Measures:	[TYPE_ELS] Others		
Main cause:	The motor use is overloaded.		
	[Subcode]		
	1: The motor is overheated.		
	2: The power module heat sink is overheated.		
Action to take:			
Error number	23	Excessive position deviation	Long: OverPerr
Error type:	[KIND_SRV] Servo error	Short:	OverPerr
Measures:	[TYPE_ELS] Others		
Main cause:	The position deviation was greater than the tolerance.		
Action to take:	Perform the servo adjustment again. If an error still occurs, extend the tolerance.		
Error number	24	Over speed	Long: OverSpeed
Error type:	[KIND_RGR] Always error	Short:	OverSpeed
Measures:	[TYPE_ELS] Others		
Main cause:	The velocity was higher than the maximum velocity.		
Action to take:			

Error number	30	Servo not ready
Error type:	[KIND_ERR] error	Long: ServoNotReady
Measures:	[TYPE_E2] Stop deceleration.	Short: SrvNotRdy
Main cause:	The servo was not ready for the process that requires the servo to be ON.	
Action to take:	Perform an error reset operation, turn ON the servo, and execute again.	
Error number	31	Excessive position command differential value
Error type:	[KIND_ERR] error	Long: OverDiffPcmd
Measures:	[TYPE_ELS] Others	Short: OverDPcmd
Main cause:	The position command with the variation rate that was greater than the maximum velocity was given.	
Action to take:	The velocity override may be 100% or more. Verify it.	
Error number	42	+ direction hardware over-travel
Error type:	[KIND_ERR] error	Long: Hard_OT_+_direction
Measures:	[TYPE_ELS] Others	Short: +_Hard_OT
Main cause:	The + direction hardware over-travel signal was detected while moving to the + direction.	
Action to take:	Perform an error reset operation, then move to the - direction.	
Error number	43	- direction hardware over-travel
Error type:	[KIND_ERR] error	Long: Hard_OT_-direction
Measures:	[TYPE_ELS] Others	Short: -_Hard_OT
Main cause:	The - direction hardware over-travel signal was detected while moving to the - direction.	
Action to take:	Perform an error reset operation, then move to the + direction.	
Error number	44	+ direction software over-travel
Error type:	[KIND_ERR] error	Long: Soft_OT_+_direction
Measures:	[TYPE_E2] Stop deceleration.	Short: +_Soft_OT
Main cause:	Attempted to move to outside of the + direction area via positioning move, but the command unit command value was outside of the + direction area.	
Action to take:	Perform an error reset operation. If the command unit command value is outside of the area, move to the - direction. This error occurs only for the linear coordinates.	

Error number	45	- direction software over-travel
Error type:	[KIND_ERR] error	Long: Soft_OT_-_direction
Measures:	[TYPE_E2] Stop deceleration.	Short: -_Soft_OT
Main cause:	Attempted to move to outside of the - direction area via positioning move, but the command unit command value was outside of the - direction area.	
Action to take:	Perform an error reset operation. If the command unit command value is outside of the area, move to the + direction. This error occurs only for the linear coordinates.	
Error number	46	Emergency stop
Error type:	[KIND_RGR] Always error	Long: EmergencyStop
Measures:	[TYPE_E2] Stop deceleration.	Short: EMG_Stop
Main cause:	An emergency stop instruction was entered.	
Action to take:	Reset the error.	
Error number	49	Homing error
Error type:	[KIND_ERRALM1] Error/operation alarm	Long: OriginError
Measures:	[TYPE_E2] Stop deceleration.	Short: OriginErr
Main cause:	An error occurred during homing operation. [Subcode] 1: Locating fixture position problem	
Action to take:		
Error number	50	Cannot execute
Error type:	[KIND_ERRALM2] Error/operation alarm	Long: CantExec
Measures:	[TYPE_E2] Stop deceleration.	Short: CantExec
Main cause:	Cannot execute. [Subcode] 1: Prohibited command 2: Execution in progress 3: Error status 4: Data is being used. 5: Invalid data 6: Access timing 7: Driver mode 8: Invalid program file 9: Nesting overflow	
Action to take:		

Error number	51	Data not ready
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Long:

DataNotReady

Short:

DataNotRdy

Error type: [KIND_ERRALM2] Error/operation alarm

Measures: [TYPE_E2] Stop deceleration.

Main cause: Data is not ready.

[Subcode]

- 2: Part data
- 3: Program file
- 4: Index A correction file
- 6: Index B file

Action to take:

Error number	52	Timeout
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Long:

TimeOut

Short:

TimeOut

Error type: [KIND_ERRALM1] Error/operation alarm

Measures: [TYPE_E2] Stop deceleration.

Main cause: A timeout occurred during internal processing.

Action to take: Contact us.

Error number	53	Cannot calculate
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Long:

CantCalc

Short:

CantCalc

Error type: [KIND_ERRALM1] Error/operation alarm

Measures: [TYPE_E2] Stop deceleration.

Main cause: The condition that cannot be calculated occurred during internal processing.

[Subcode]

- 1: Auto tuning

Action to take: Contact us.

Error number	60	Cannot interpret	Long: CantInterpret
Error type:	[KIND_ERRALM2]	Error/operation alarm	Short: CantIntp
Measures:	[TYPE_E2]	Stop deceleration.	
Main cause:	The command cannot be interpreted.		
Action to take:			
Error number	61	Command format error	Long: FormatError
Error type:	[KIND_ERRALM2]	Error/operation alarm	Short: FormatErr
Measures:	[TYPE_E2]	Stop deceleration.	
Main cause:	A command format error occurred.		
Action to take:			
Error number	62	Data is out of range	Long: Out_ofRange
Error type:	[KIND_ERRALM2]	Error/operation alarm	Short: OutOfRange
Measures:	[TYPE_E2]	Stop deceleration.	
Main cause:	The data is out of range.		
Action to take:			
Error number	63	Operation error	Long: OperationError
Error type:	[KIND_ALM]	Operation alarm	Short: OperateErr
Measures:	[TYPE_E2]	Stop deceleration.	
Main cause:	An operation error occurred. [Subcode] 1: Prohibited operation in machine setting mode 2: Prohibited operation while holding an operation		
Action to take:			
Error number	65	Illegal parameter and monitor number	Long: IllegalNo
Error type:	[KIND_ERRALM2]	Error/operation alarm	Short: IllegalNo
Measures:	[TYPE_E2]	Stop deceleration.	
Main cause:	The parameter and monitor of a non-existent number was specified.		
Action to take:			

Error number	66	Illegal device
Error type:	[KIND_ALM] Operation alarm	Long: IllegalDevice
Measures:	[TYPE_E2] Stop deceleration.	Short: IlgDevice
Main cause:	An operation was attempted using a device whose operation was prohibited.	
Action to take:		
Error number	67	Write protected
Error type:	[KIND_ERRALM2] Error/operation alarm	Long: WriteProtected
Measures:	[TYPE_E2] Stop deceleration.	Short: WrtProtect
Main cause:	A write access was attempted to an area that is prohibited to be written.	
Action to take:		
Error number	80	No such command
Error type:	[KIND_ALM] Operation alarm	Long: NoSuchCommand
Measures:	[TYPE_E2] Stop deceleration.	Short: NoSuchCmd
Main cause:	A non-existent command was specified.	
Action to take:		
Error number	81	Not registered
Error type:	[KIND_ALM] Operation alarm	Long: NotRegistered
Measures:	[TYPE_E2] Stop deceleration.	Short: NotRegistd
Main cause:	Registration did not complete normally.	
Action to take:		
Error number	82	Out of memory
Error type:	[KIND_ALM] Operation alarm	Long: Out_ofMemory
Measures:	[TYPE_E2] Stop deceleration.	Short: MemoryLow
Main cause:	Insufficient memory	
Action to take:		

Error number**85 Device conflict****Long:**

DeviceConflict

Short:

DevConflic

Error type: [KIND_ALM] Operation alarm

Measures: [TYPE_E2] Stop deceleration.

Main cause: An operation was attempted by another device while other device was being operated.

Action to take: